CoProcess 2025 Software User Manual

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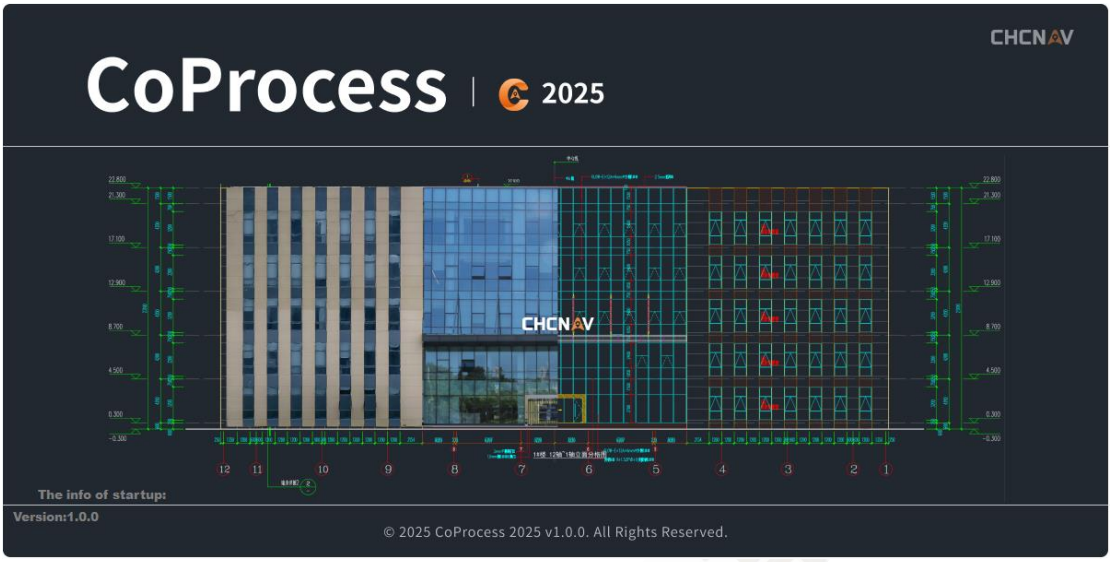
CHC Navigation Release

Compilation	Inspection	Approval

Introduction



1.Installation

1.1 Software Installation

1.1.1 Installation Steps

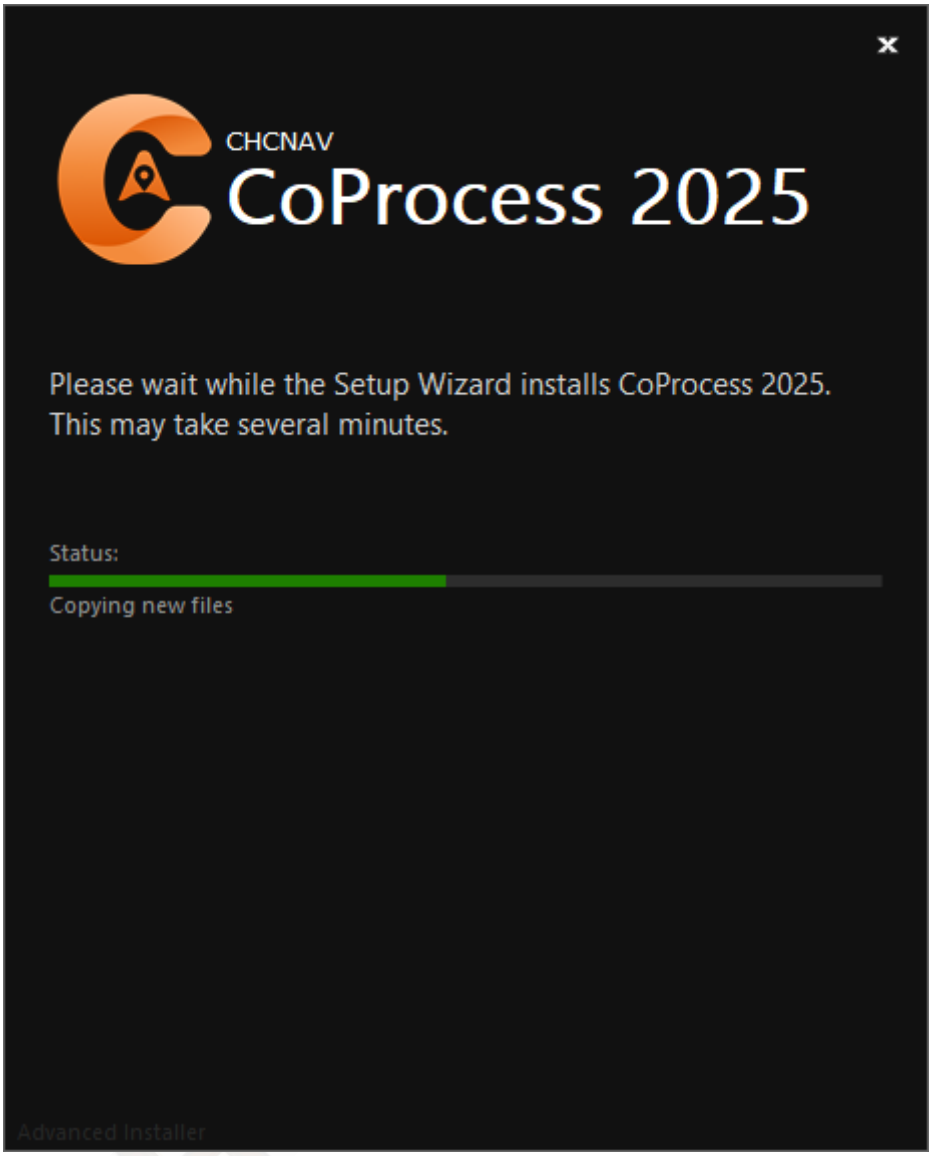
① Double-click the software installation package to pop up the software installation i nterface.

Installation Interface

② Set the installation path (usually keep the default), check the box "I agree to the l

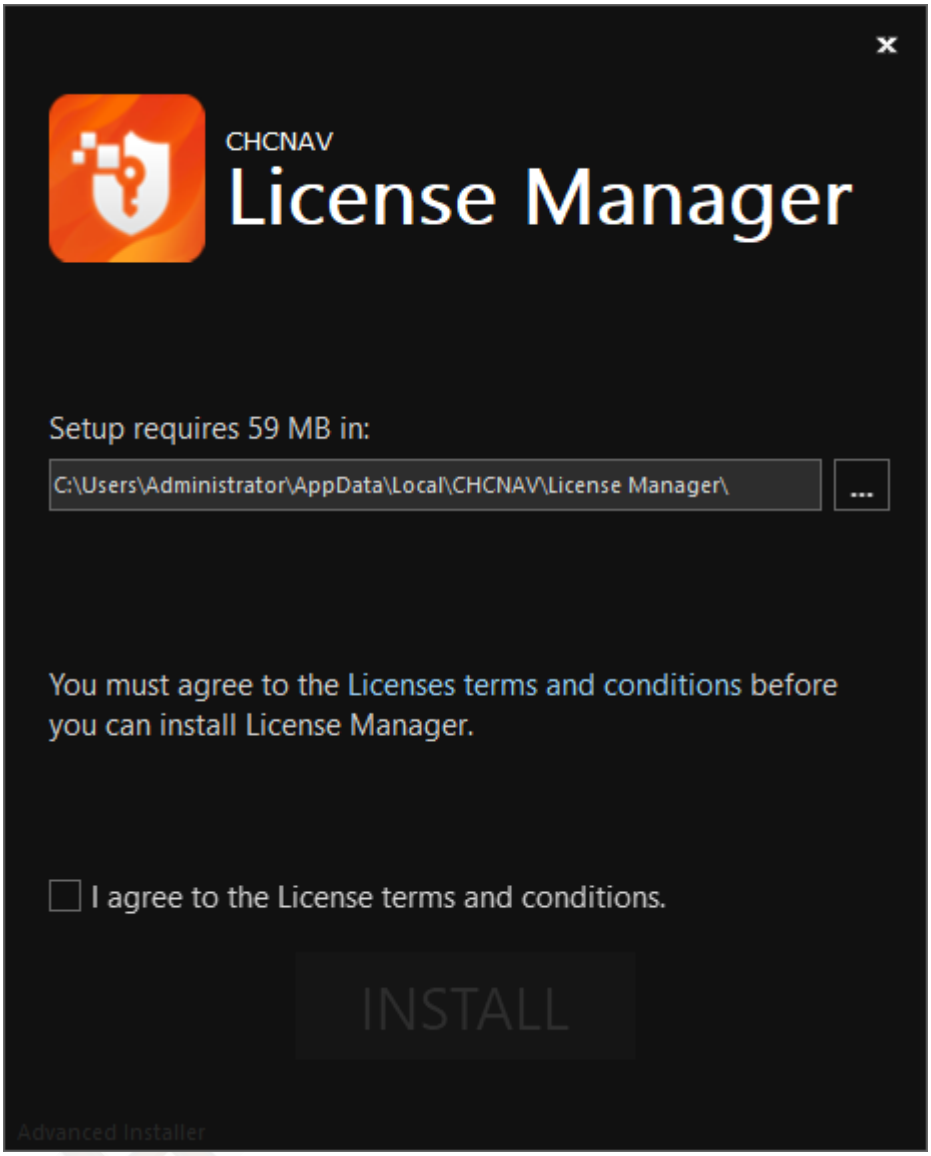
icense terms and conditions", and then click "Install".

Set Installation Path



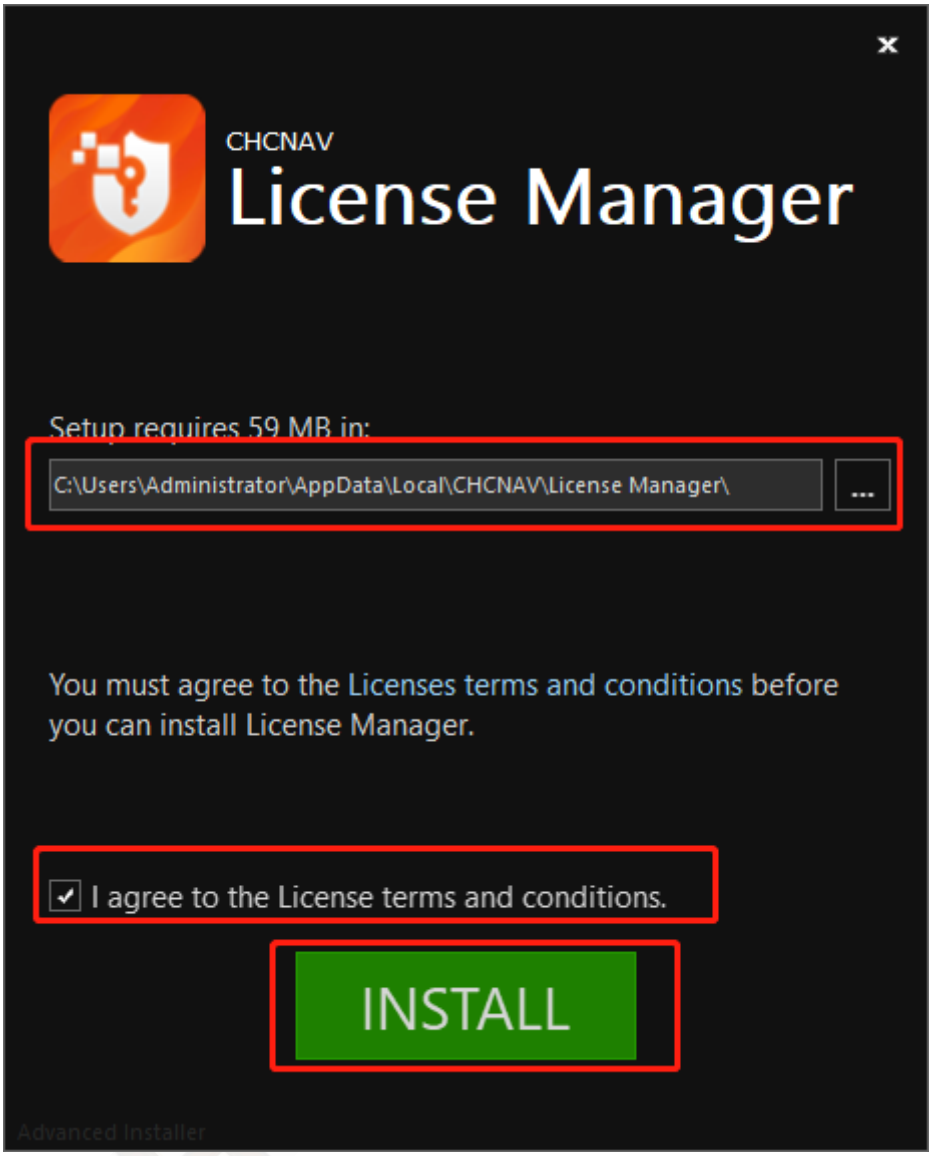
Waiting for Installation

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



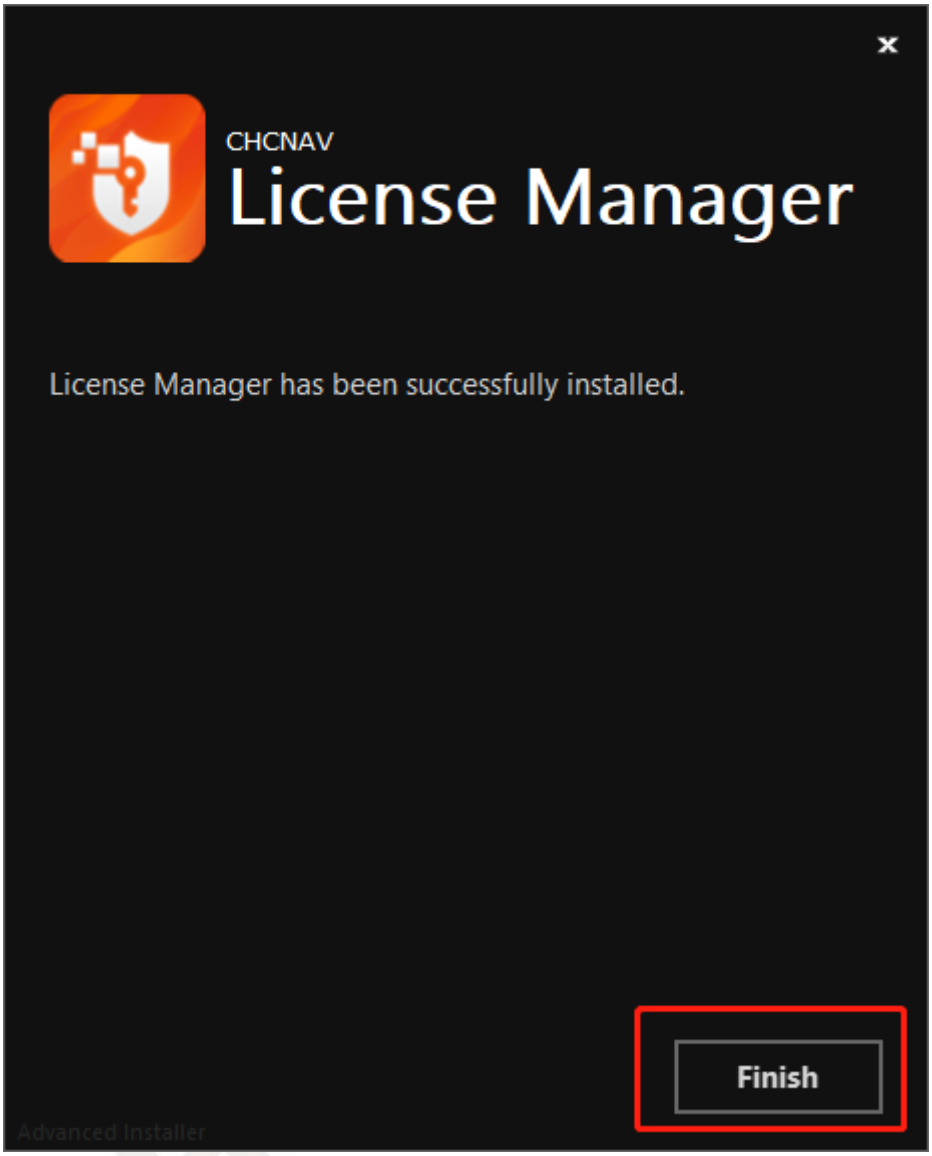
License Manager Installation Interface

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 ins tallation process to complete.



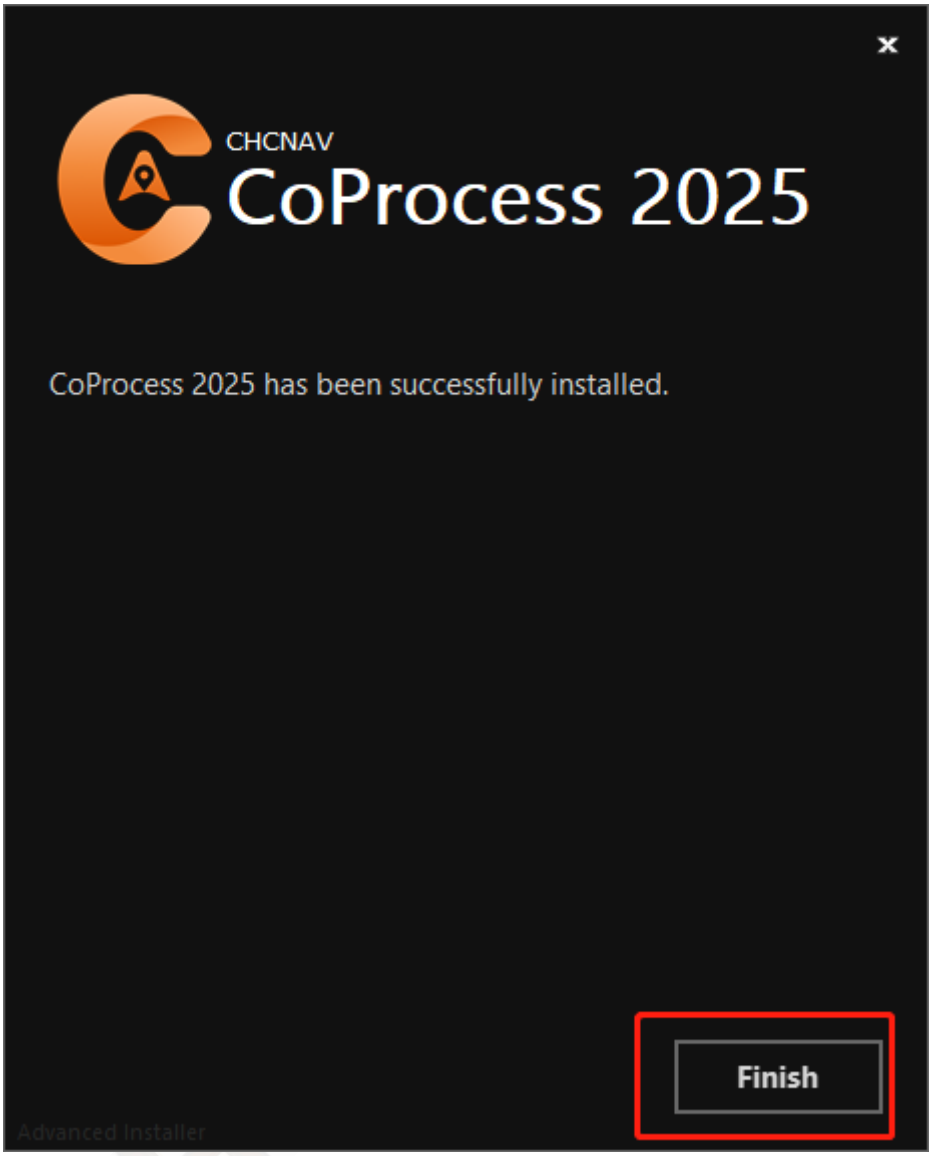
Set installation path

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



License Manager Installation Completed

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



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 NVI DIA GeForce 1050 Ti, recommended 3060 series or more, AMD graphics card is not supported.

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

1.1.3 Software Uninstallation

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

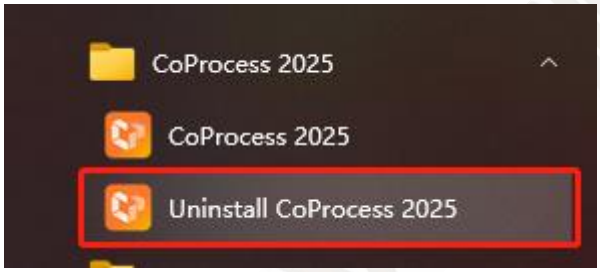


Figure: CoProcess in Start Menu

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

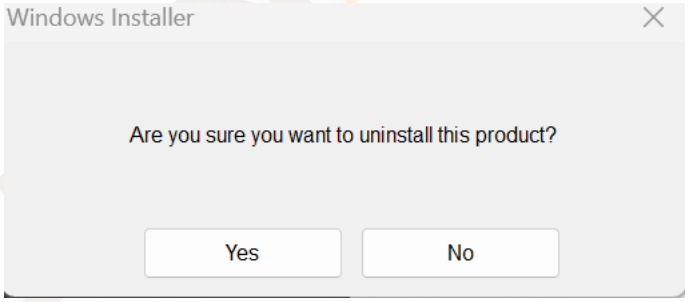


Figure: Uninstall Confirmation

2.Introduction to Software Functions

2.1 Software Window

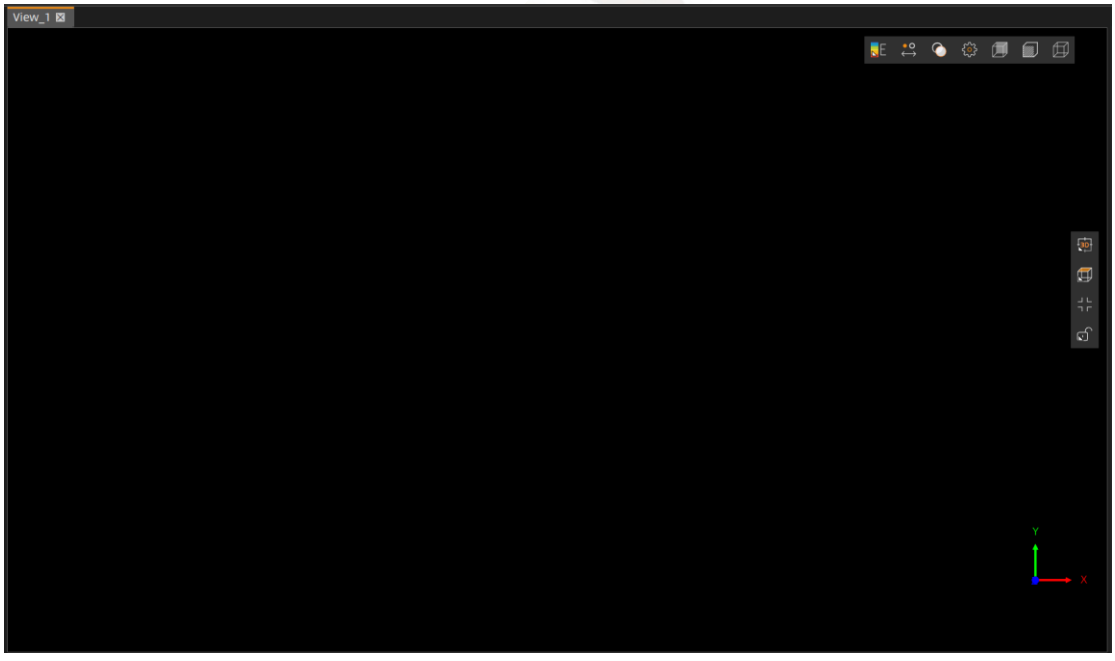
2.1.1 Toolbar in the 3D View

Function description:

In the 3D view, there are two sets of toolbars, horizontal and vertical, and they are b oth in the upper right area of the 3D view window.

The functions in the horizontal toolbar, from left to right, are point cloud rendering, p oint size setting, opacity setting, point cloud rendering settings, model wireframe rende ring, model texture rendering, and model wireframe-only rendering.

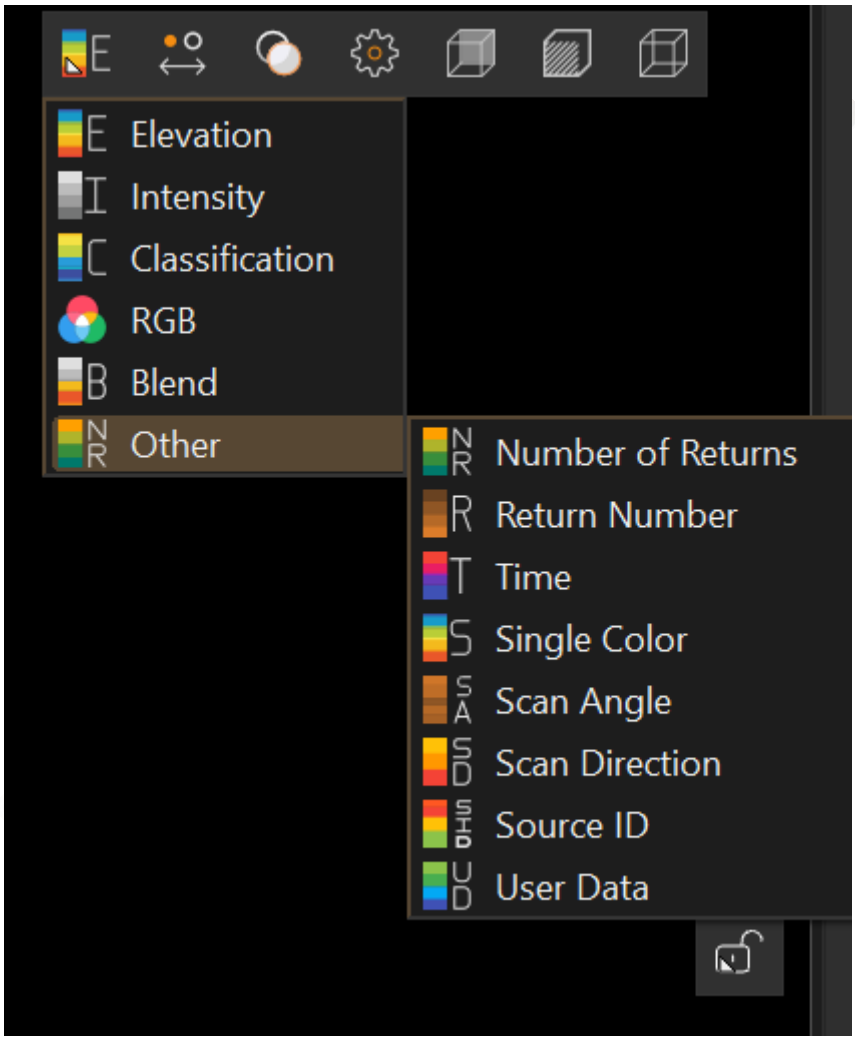
The functions in the vertical toolbar, from top to bottom, are view angle, view directi on, center display, and view lock.



Toolbar in the 3D View

2.1.1.1 Point Cloud Rendering

This section mainly introduces the point cloud rendering in the 3D view. Point cloud rendering can render point clouds in different ways, enabling users to obtain the required information from different renderings. It mainly includes elevation rendering, intensity rendering, classfication rendering, RGB rendering, blend rendering, and other rendering methods. The other rendering methods include return rendering, return number rendering, time rendering, single color rendering, scan angle rendering, scan direction rendering, source ID rendering, and user data rendering.



Point cloud rendering method

Note:

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

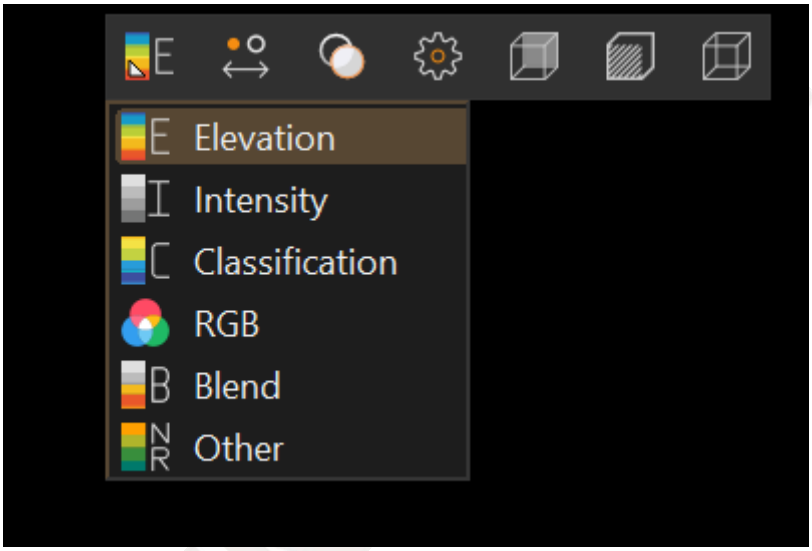
2.1.1.1.1 Elevation Rendering

Function description:

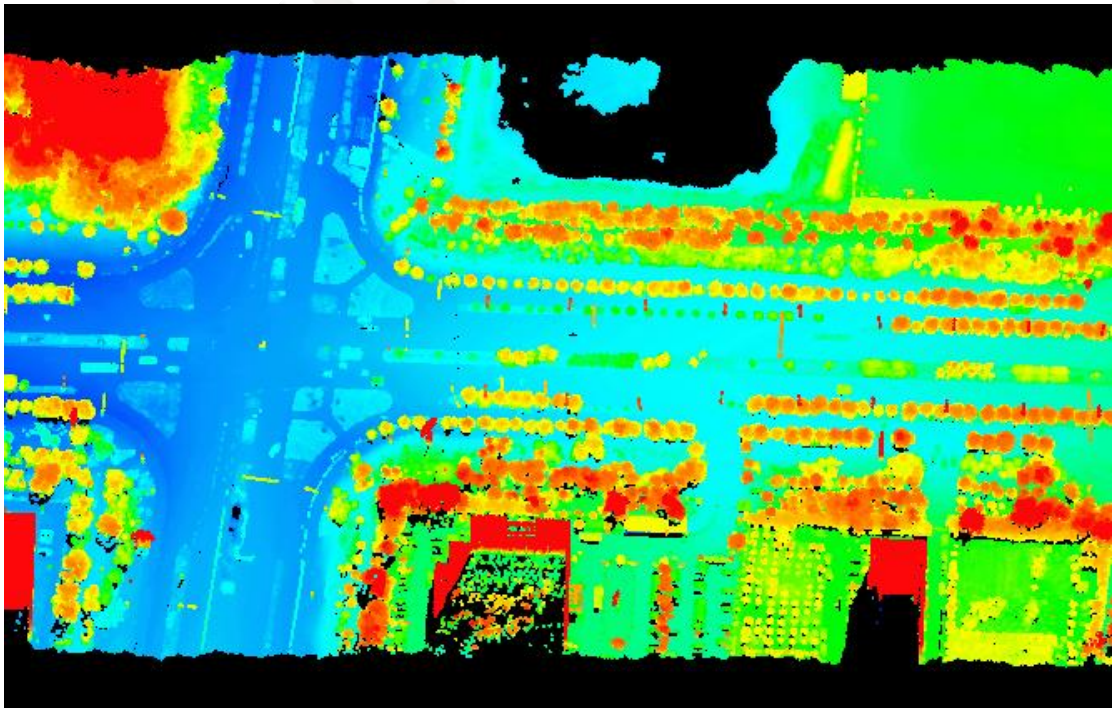
Map the point cloud data to a specified color range based on its elevation values, wh ich facilitates the observation of elevation changes in the point cloud data.

Operation steps:

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

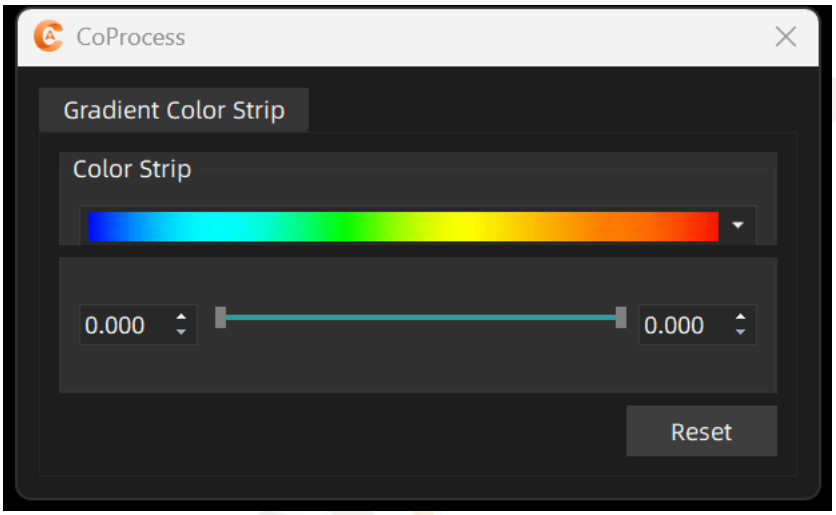


Elevation Rendering Mode



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 modify the maximum and minimum values of the elevation range by adjusting the scroll bar, scrolling the mouse wheel, or entering numbers, and then you can modify the elevation rendering effect in real time. The "Reset" option is used to restore the default values.



Elevation Rendering Settings

Note:

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

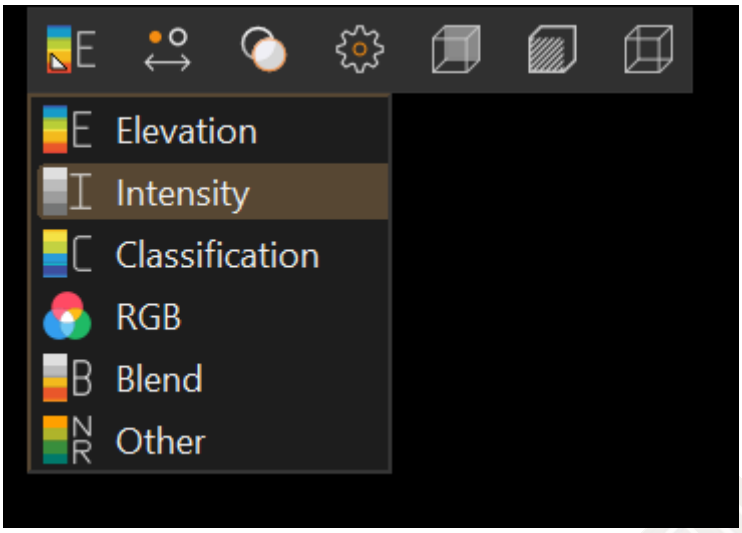
2.1.1.1.2 Intensity Rendering

Function description:

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

Operation steps:

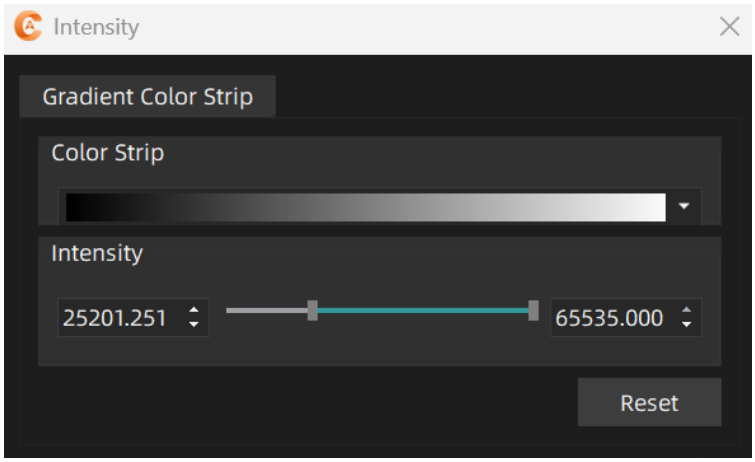
 Click on the toolbar in the 3D view -> Point Cloud Rendering -> Color by intensity.



Intensity Rendering Mode

Intensity Rendering

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.



Intensity Rendering Settings

Note:

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

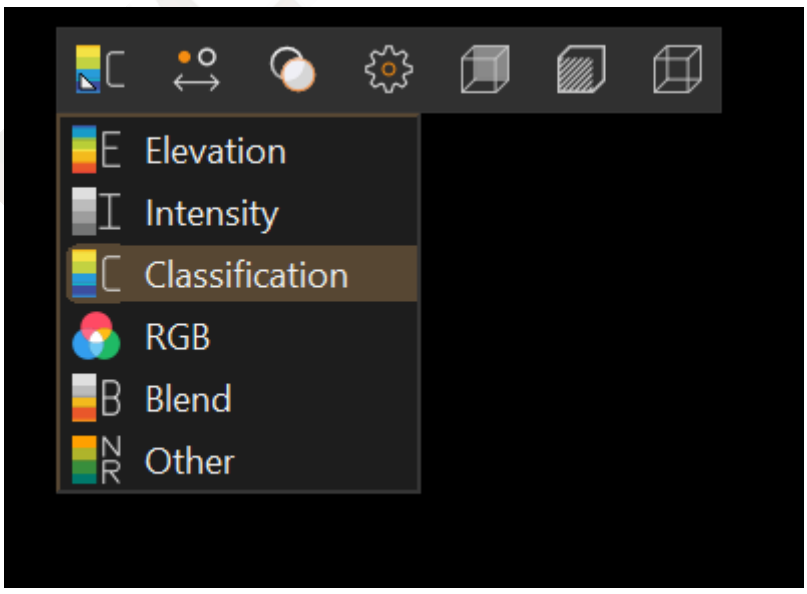
2.1.1.1.3 Classification Rendering

Function description:

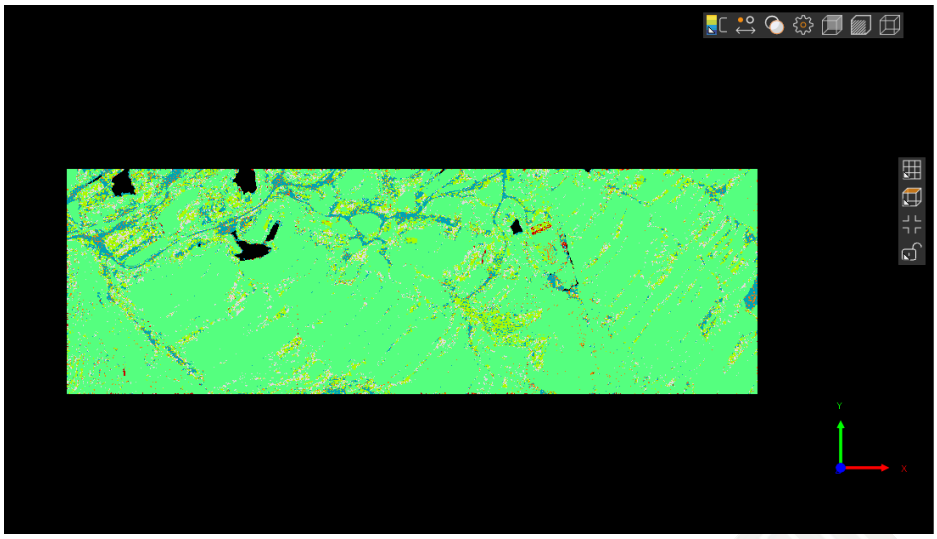
Map each classification to a distinct color value based on different categories, enablin g intuitive differentiation of point cloud data.

Operation steps:

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

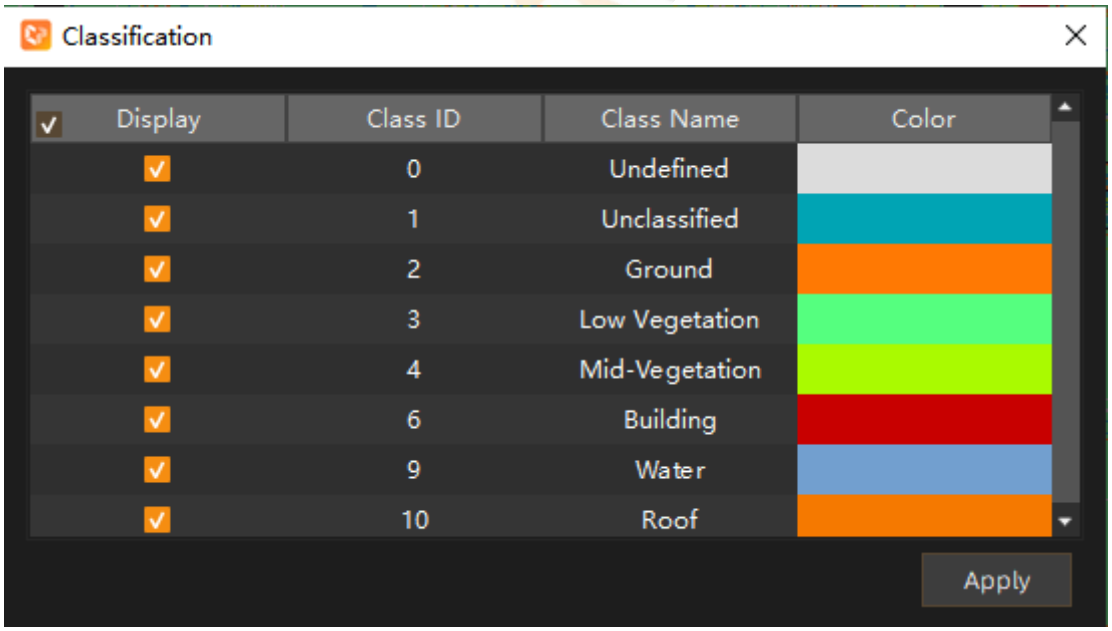


Classification Rendering Mode



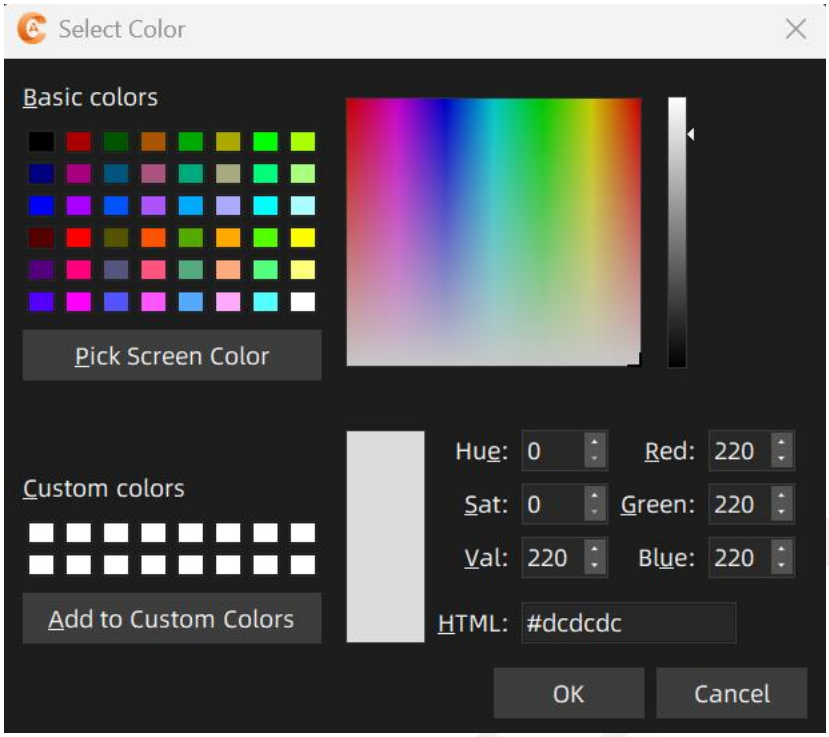
Classification Rendering

② Click on Rendering Settings. As shown in the figure below, the default setting is to render all categories. Uncheck the Select All checkbox to cancel the rendering display of all categories. Uncheck the checkbox of a specific category to cancel its display.



Classification Settings

③ Click the color on the right side of a classification to load the color list. You can select basic colors, and it also supports capturing screen colors. Pick a color in the right-side color mapping table and click OK to modify the rendering color of the classification.



Classification Color Settings

Note:

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

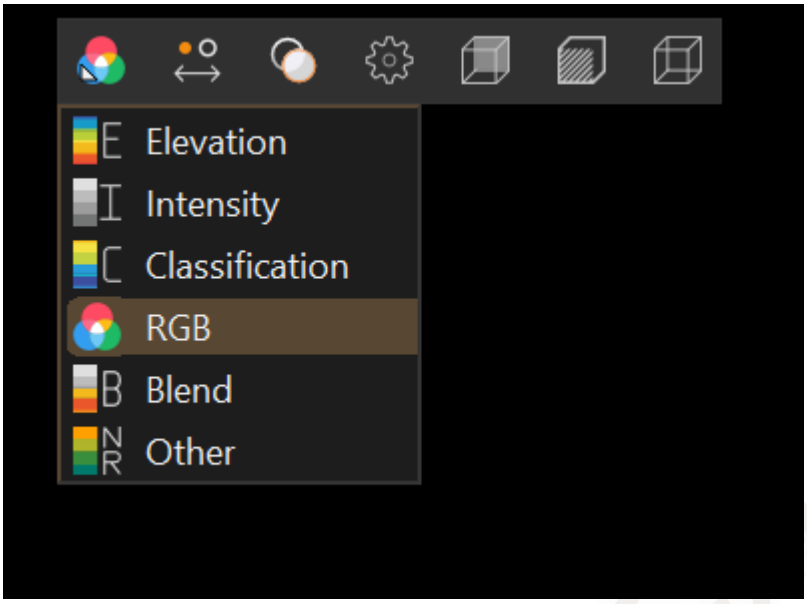
2.1.1.1.4 RGB Rendering

Function description:

Display point cloud data using its color attributes (RGB values).

Operation steps:

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



RGB Rendering Mode

② The point cloud data in the view is rendered and displayed according to its own RGB color value, as shown in the following figure:

RGB Coloring Rendering

Note:

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

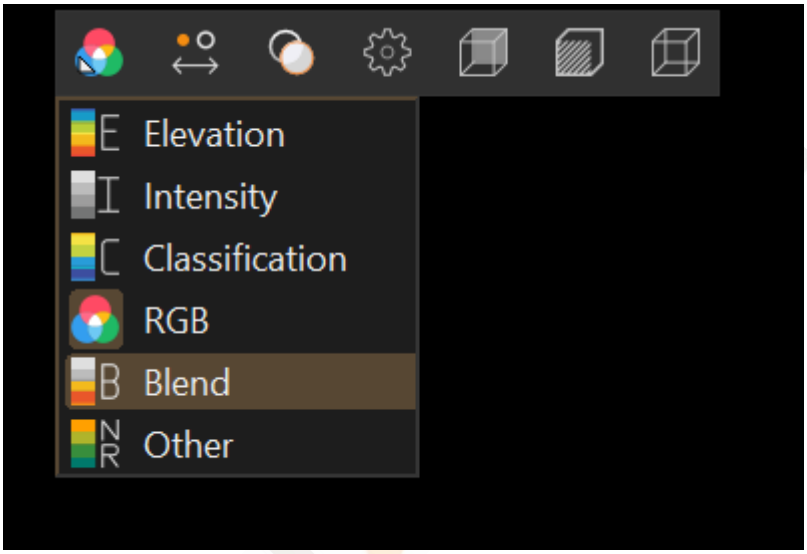
2.1.1.1.5 Blend Rendering

Function description:

This function enables mixed rendering of point cloud data by mapping its elevation and intensity attributes to uniformly varying color intervals. It shows the combined effects of elevation and intensity changes, facilitating clear distinction of feature boundaries.

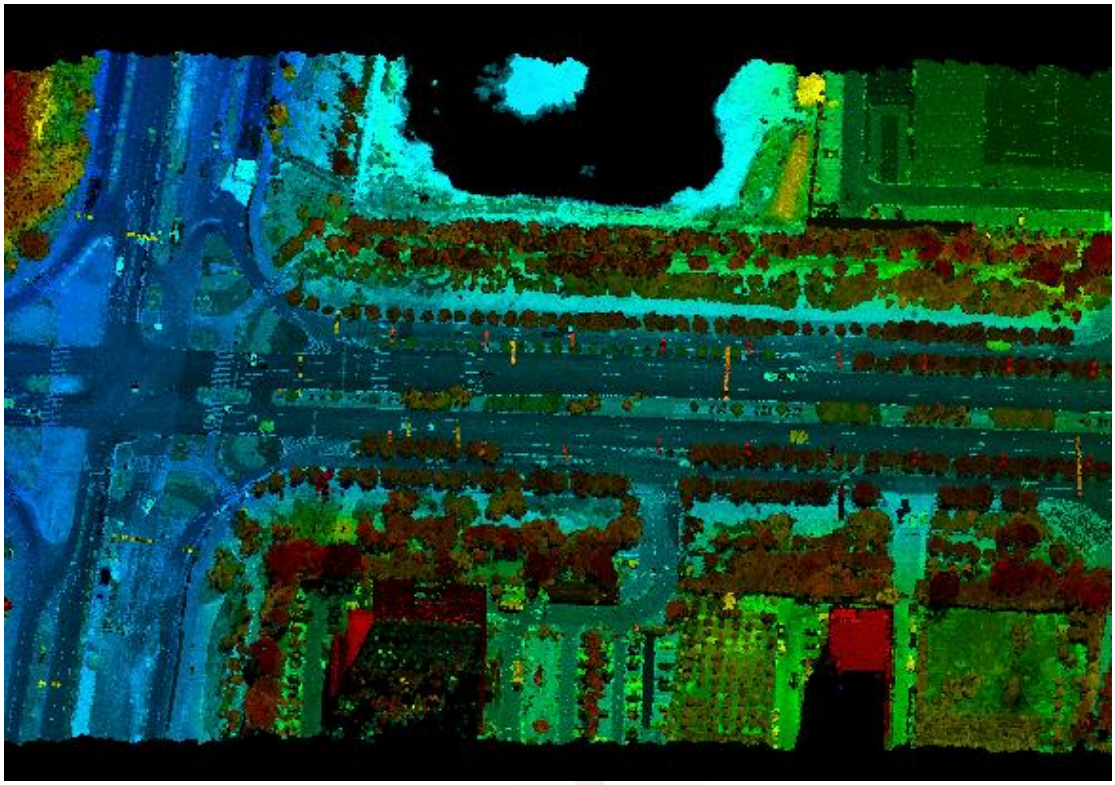
Operation steps:

① Click on 3D View Toolbar -> Point Cloud Rendering -> Color by blending



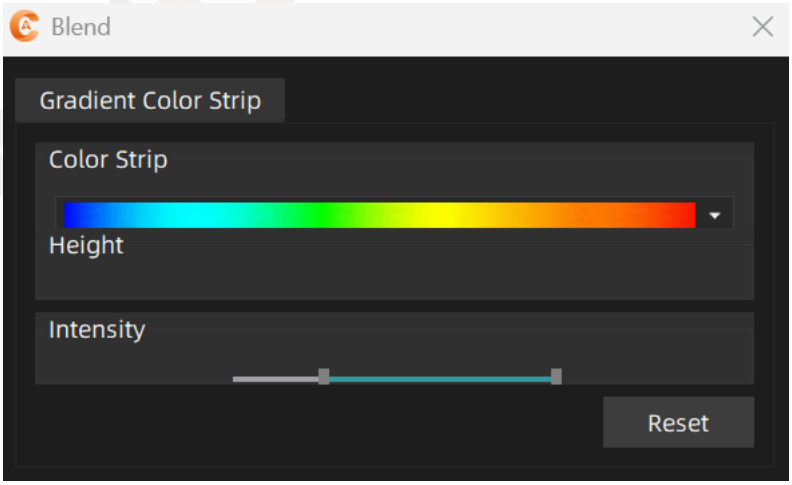
Blend Rendering Mode

② After selecting the color bar, the point cloud after blending rendering will display in the view.



Blending Rendering

③ Click Rendering Settings. As shown in the figure below, move the scroll bar, scroll the wheel, or input numbers to modify the maximum and minimum values of elevation and intensity, and view the blended rendering effect in real time. Reset is used to restore default values.



Blending Rendering Settings

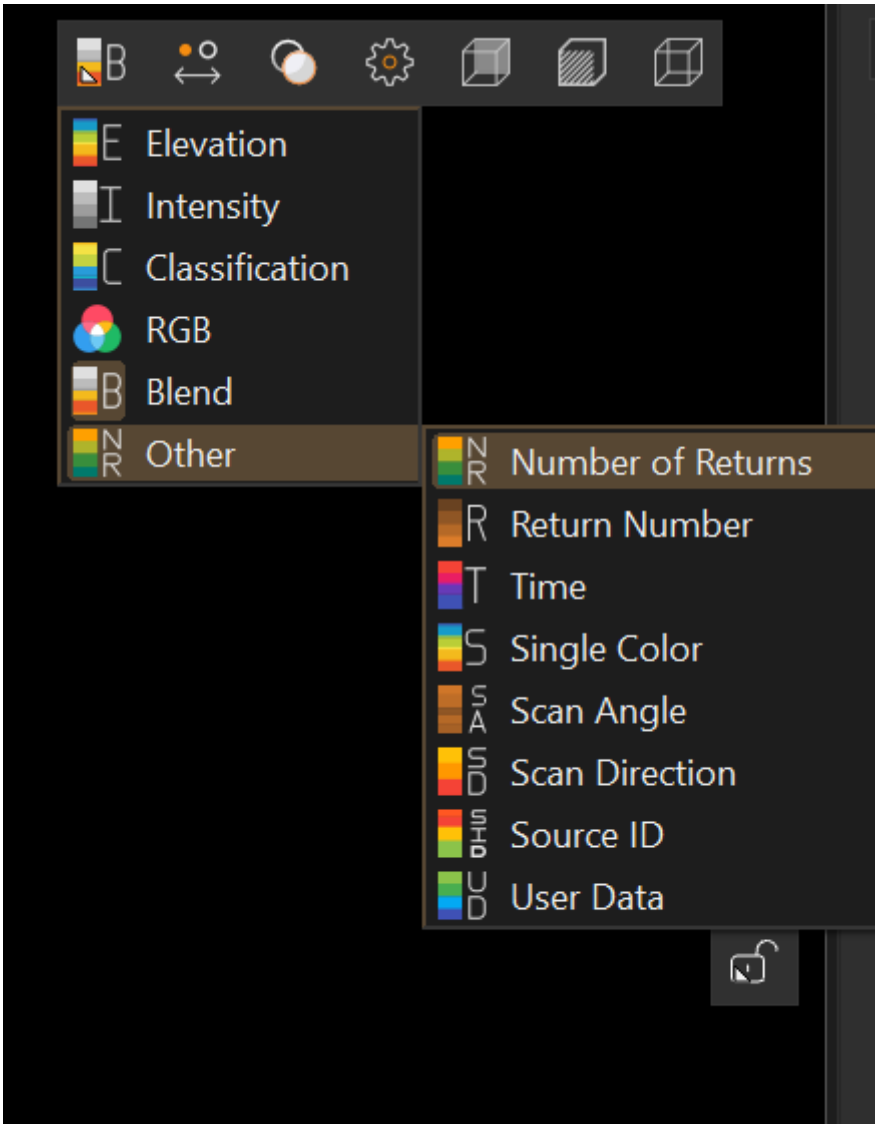
2.1.1.1.6 Echo Number Rendering

Function description:

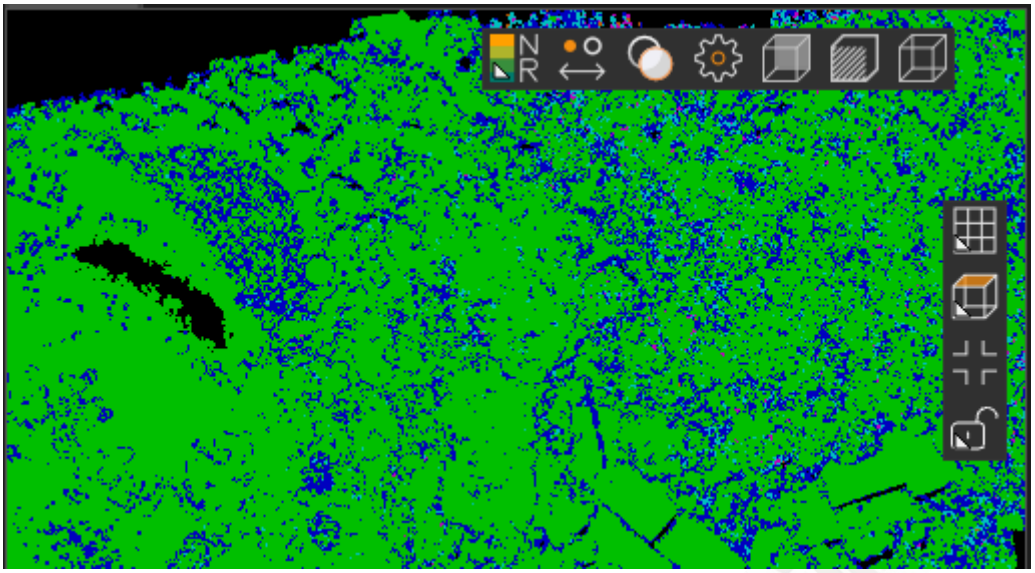
Render point clouds in different colors based on their echo number attributes to facilit ate intuitive differentiation of point cloud data with varying echo counts.

Operation steps:

① Click 3D View → Point Cloud Rendering → Other → Number of Returns in the tool bar to view the rendering results classified by different echo numbers.

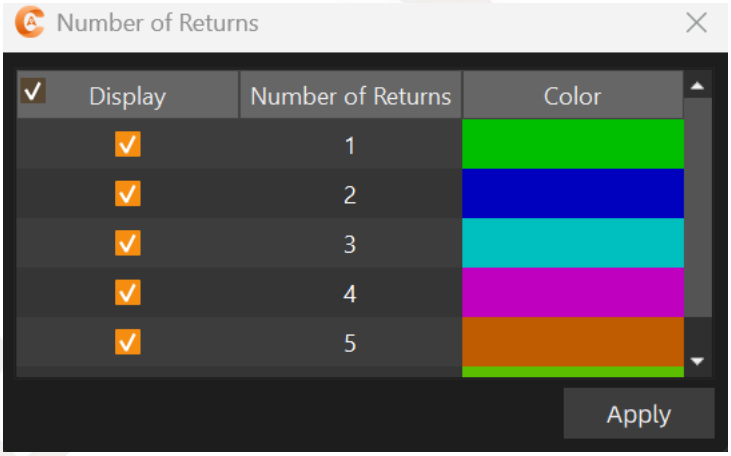


Echo Rendering Mode



Echo Rendering

② Click Rendering Settings. As shown below, all echo numbers are rendered by default. Uncheck the Select All checkbox to disable rendering for all echo numbers. Uncheck a specific echo number checkbox to hide only that echo number.

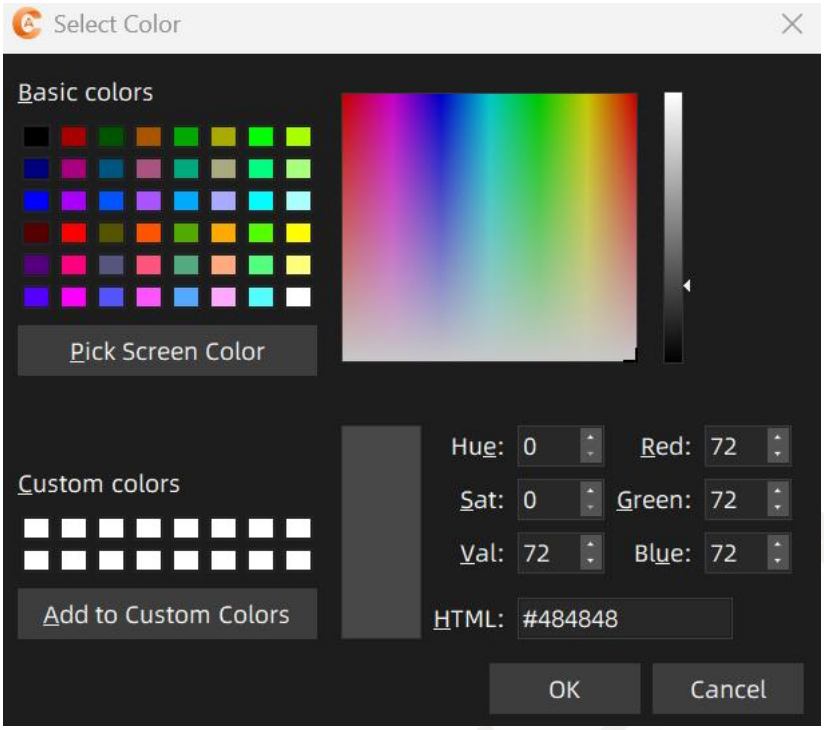


Echo Rendering Settings

③ Click the color swatch next to an echo number to open the color picker. You can:

- Select a basic color.
- Capture a screen color via clicking anywhere on the screen.
- Pick a color from the right-side color table.

Click OK to modify the rendering color for the echo.



Echo Number Settings

Note:

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

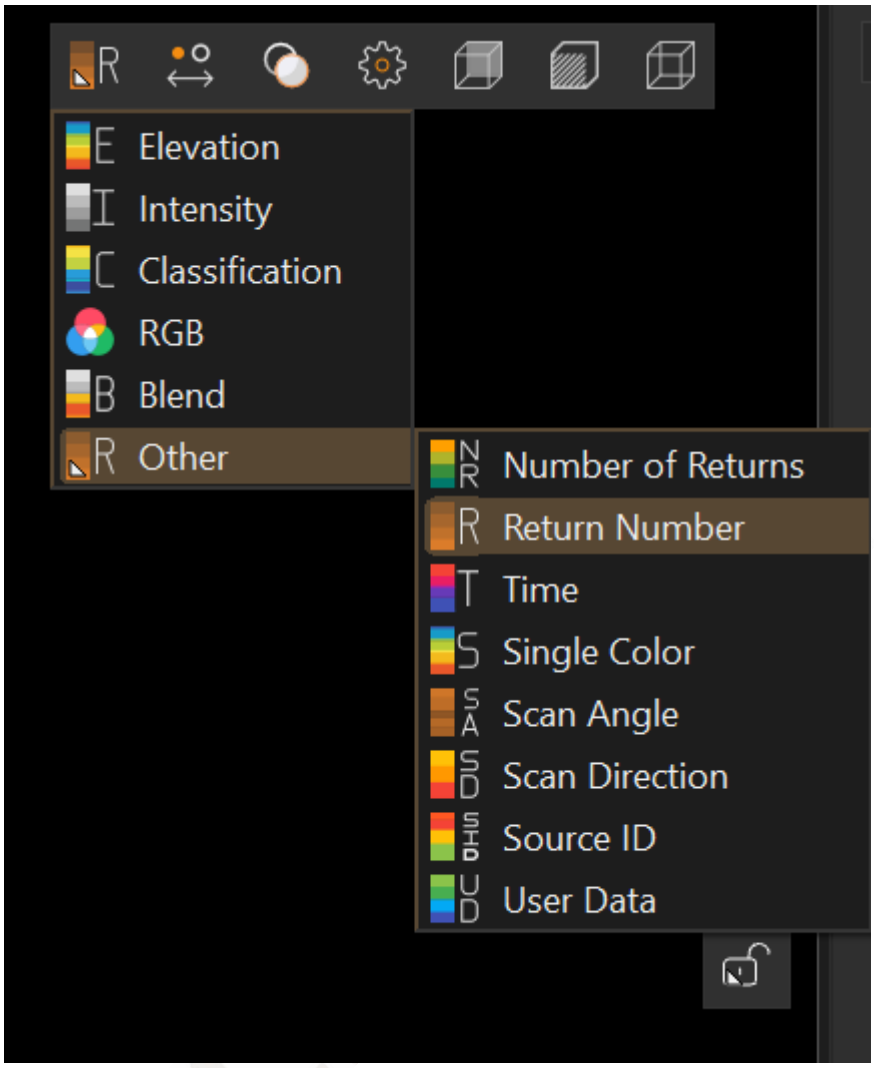
2.1.1.1.7 Echo Sequence Number Rendering

Function description:

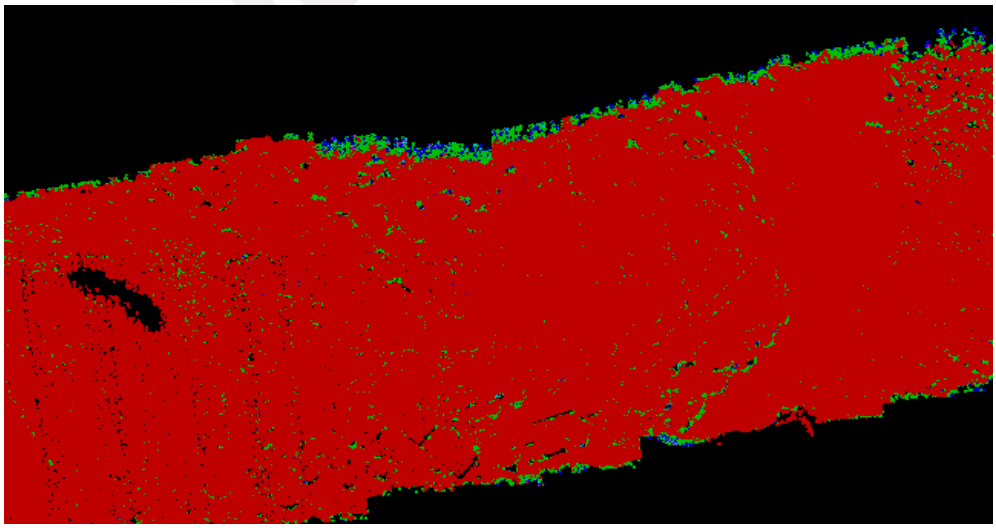
Render point clouds in distinct colors based on their echo sequence number attributes to quickly visualize the rendering effects of different echo sequences.

Operation steps:

① Click on the toolbar in the 3D view -> Point Cloud Rendering -> Other -> Retur n Number, and you can view the echo number rendering of the point cloud.



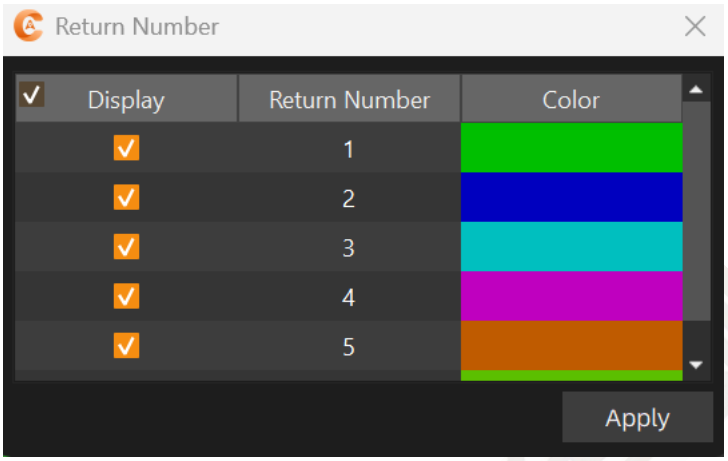
Echo Sequence Number Rendering Mode



Echo Sequence Number Rendering

② Click Rendering Settings. As shown below, all echo sequence numbers are rendere

d by default. Uncheck the Select All checkbox to disable rendering for all sequences. Uncheck a specific echo sequence number checkbox to hide only that sequence.

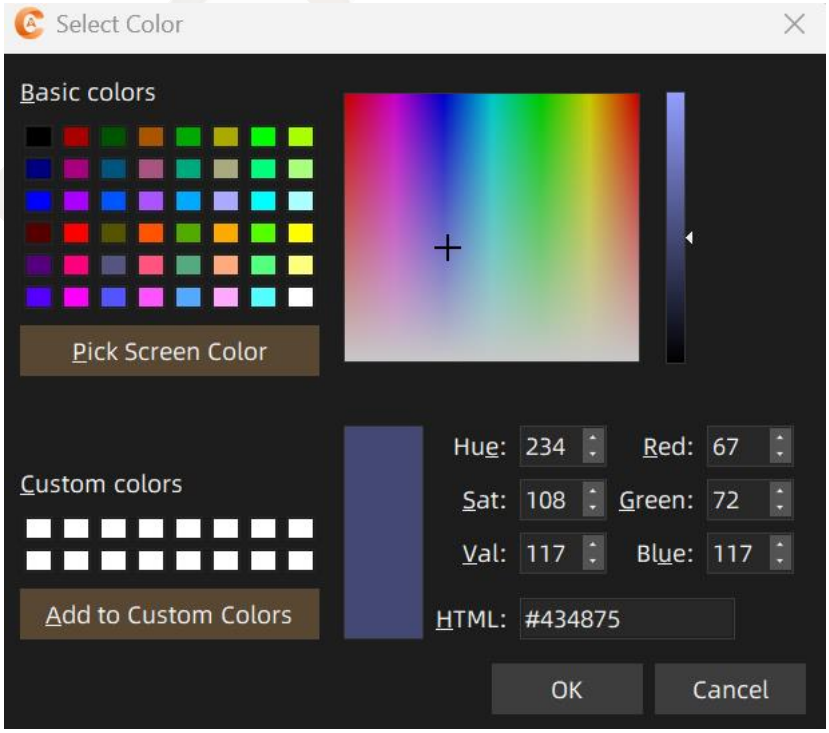


Echo Sequence Rendering Settings

③ Click the color swatch next to an echo number to open the color picker. You can:

- Select a basic color.
- Capture a screen color via clicking anywhere on the screen.
- Pick a color from the right-side color table.

Click OK to modify the rendering color for the echo.



Set Echo Sequence Number Colors

Note:

This function is only effective for point cloud data containing echo sequence number information.

2.1.1.1.8 Time Rendering

Function description:

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

Operation steps:

① Click 3D View Toolbar -> Point Cloud Rendering -> Other -> Time to view the time rendering effect.

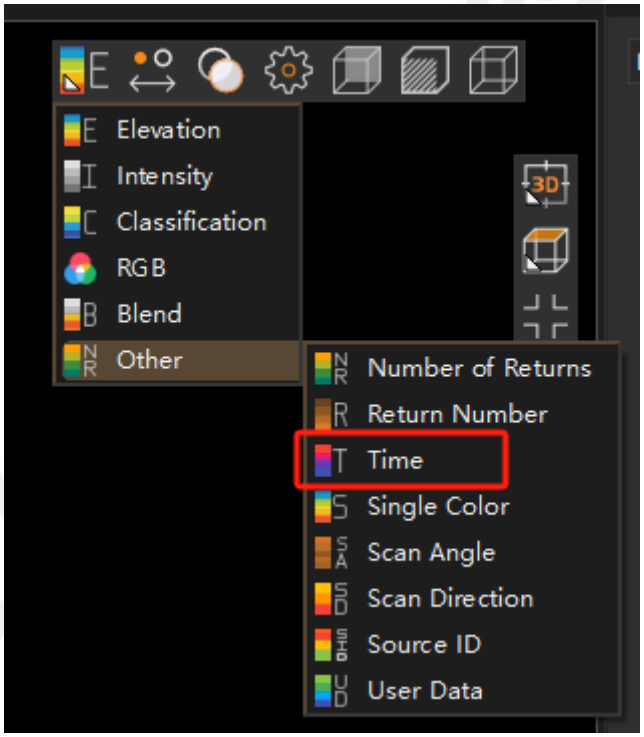


Figure: Time Rendering Function Entry

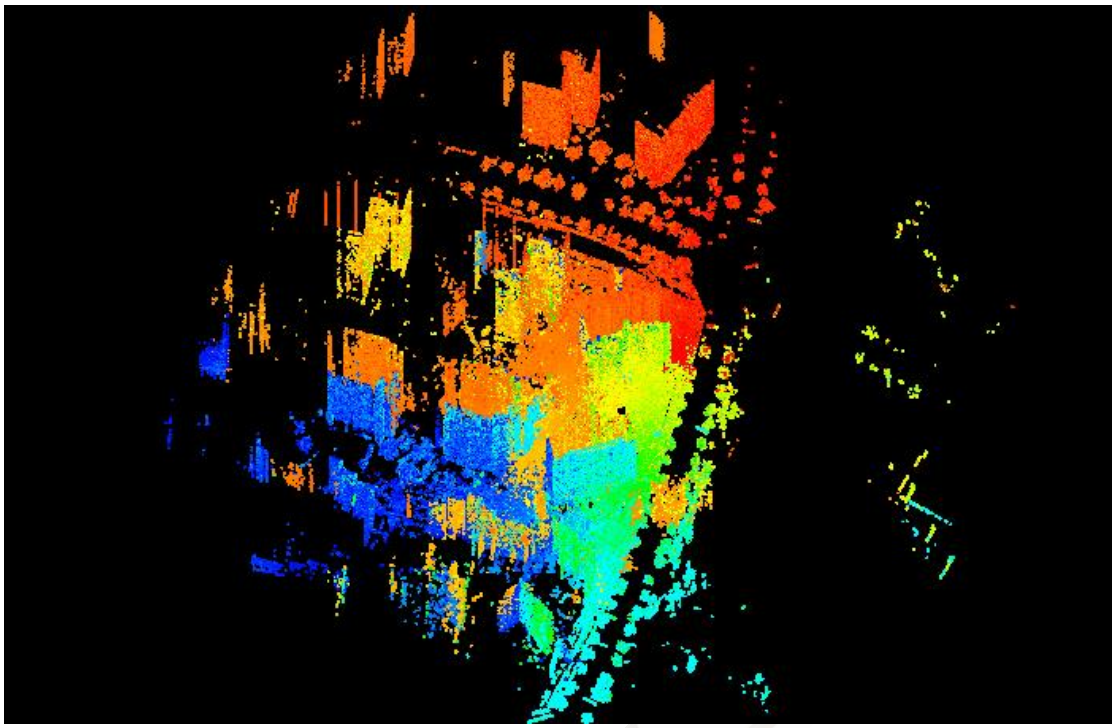


Figure: Time Rendering Effect

Figure: Time Rendering Settings

2.1.1.1.9 Single Rendering

Function Description:

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

Operation Steps:

① Click 3D View Toolbar -> Point Cloud Rendering -> Other -> Single Color to view the monochromatic rendering effect.

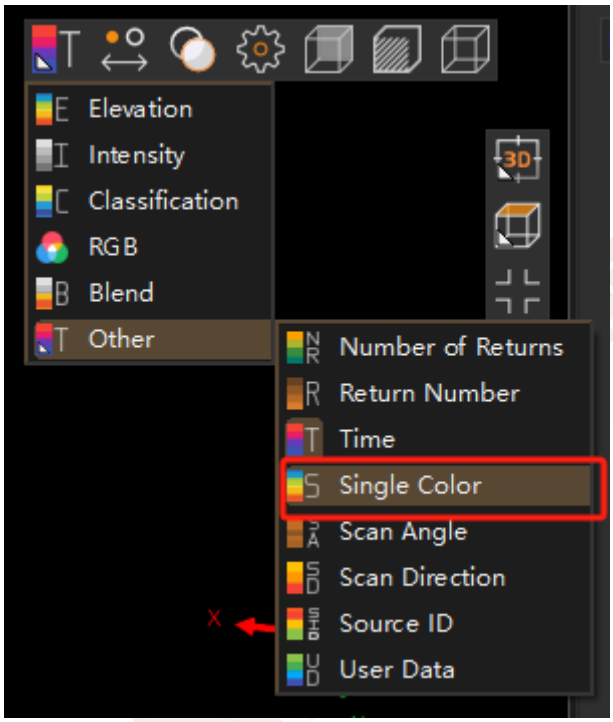


Figure: Single Color Rendering Function Entry

Figure: Single Color Rendering Effect

2.1.1.1.10 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 3D View Toolbar -> Point Cloud Rendering -> Other -> Scan Angle to view the scan angle rendering effect;

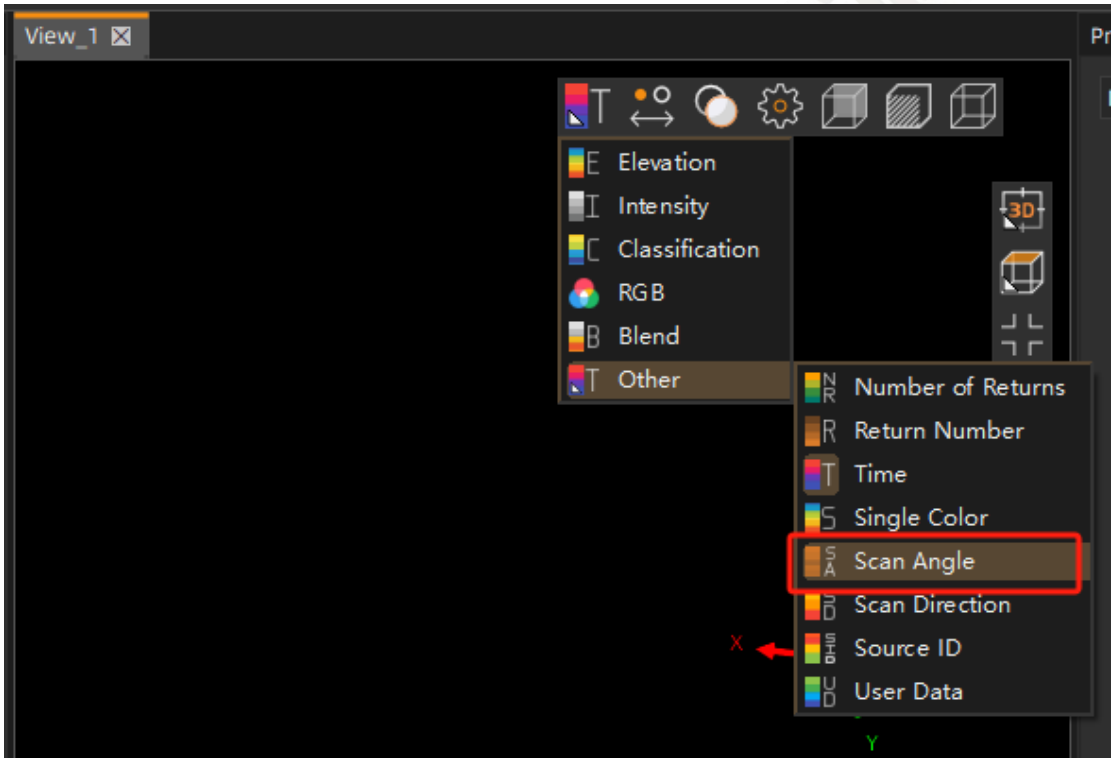


Figure: Scan Angle Rendering Function Entry

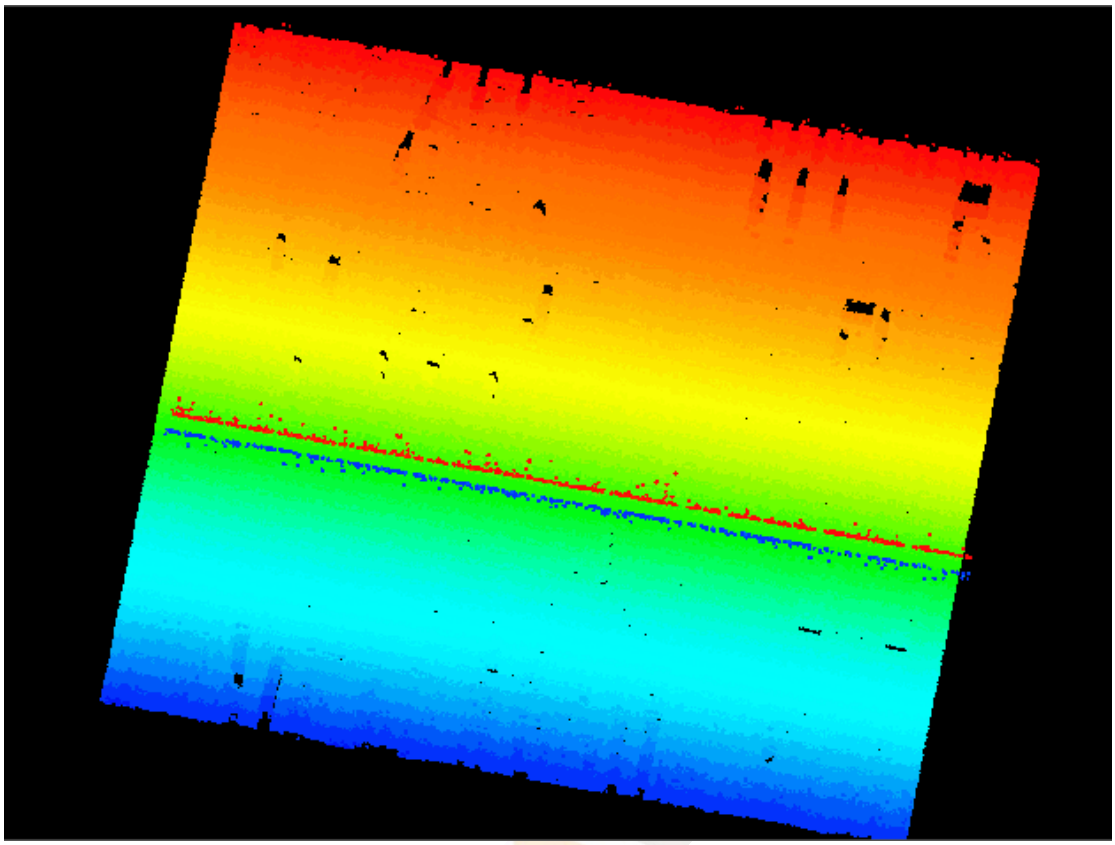


Figure: Scan Angle Rendering

② Select different color strips in the color strip as needed; click Rendering Settings, drag the scroll bar or scroll the wheel to modify the maximum and minimum values of the scan angle range, and you can view the scan angle rendering effect in real time. Reset is used to restore the default values.

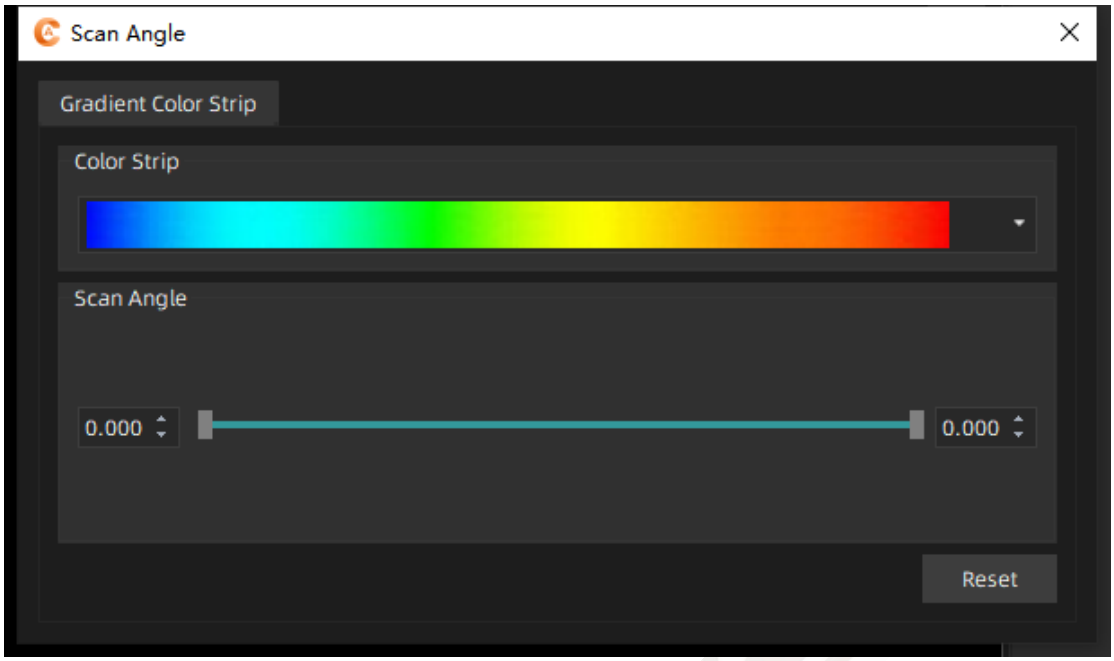


Figure: Scan Angle Rendering Settings

2.1.1.1.11 Scan Direction Rendering

Function Description:

Map the scan direction values to uniformly varying color values based on different sc an directions of the point cloud data.

Operation Steps:

① Click 3D View Toolbar -> Point Cloud Rendering -> Other -> Scan Direction to view the scan direction rendering effect.

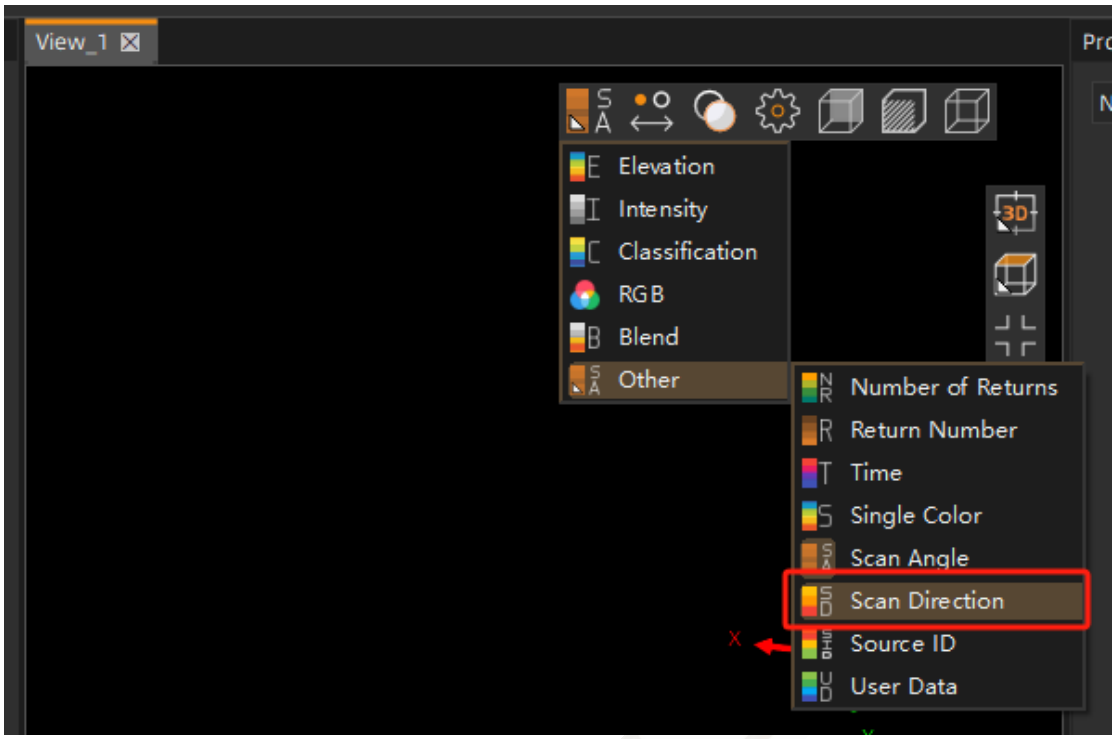


Figure: Scan Direction Rendering Function Entry

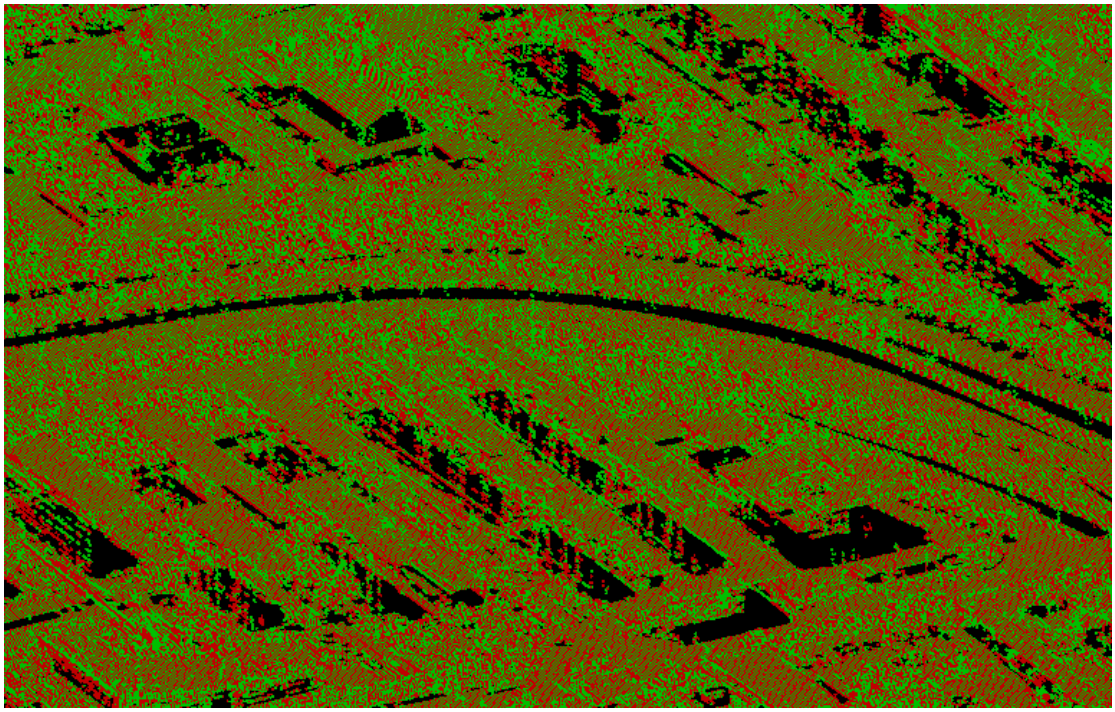


Figure: Scan Direction Rendering

② Select different color strips in the color strip as needed; click Rendering Settings, drag the scroll bar or scroll the wheel to modify the maximum and minimum values of the scan direction range, and you can view the scan direction rendering effect in real time. Reset is used to restore the default values.

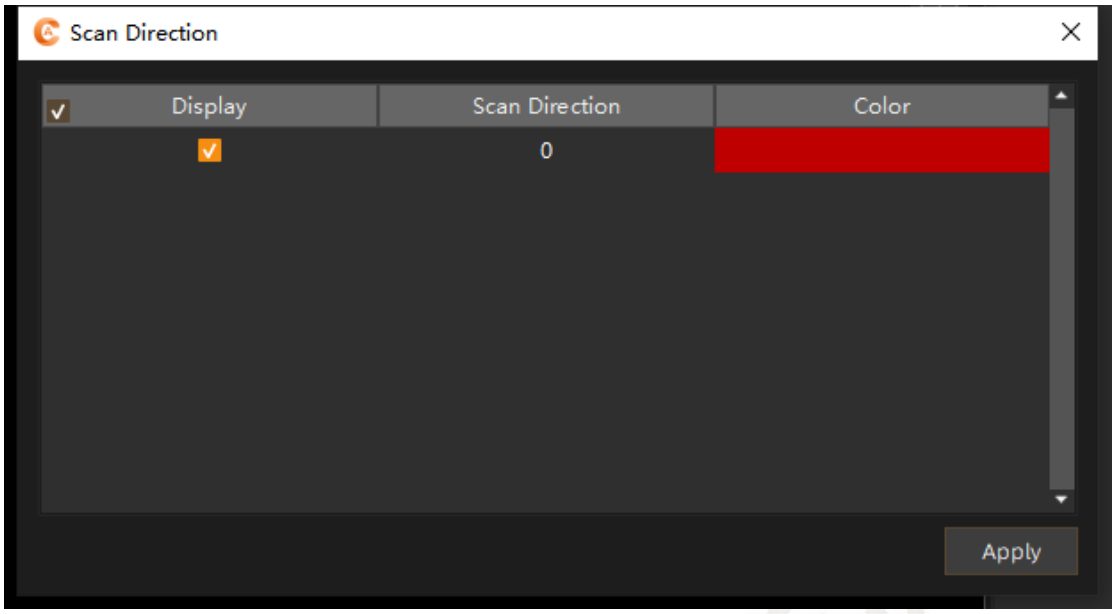


Figure: Scan Direction Rendering Settings

2.1.1.1.12 Source ID Rendering

Function Description:

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

Operation Steps:

① Click 3D View Toolbar -> Point Cloud Rendering -> Other -> Source ID to view the source ID rendering effect.

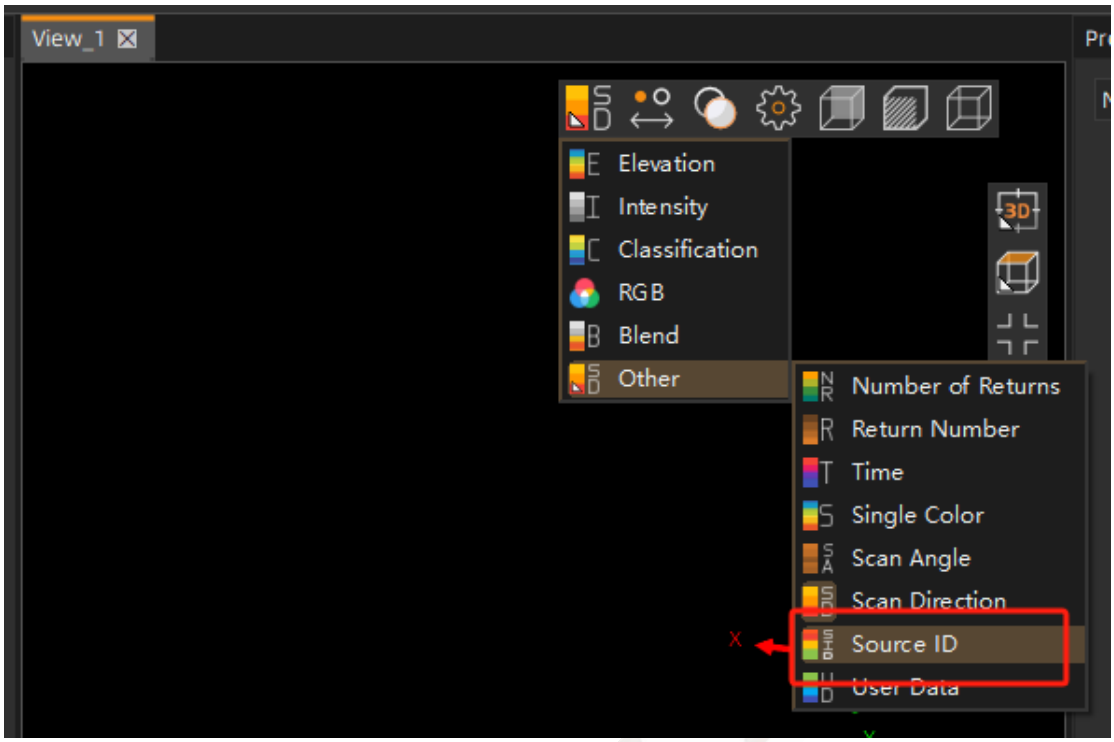


Figure: Source ID Rendering Function Entry

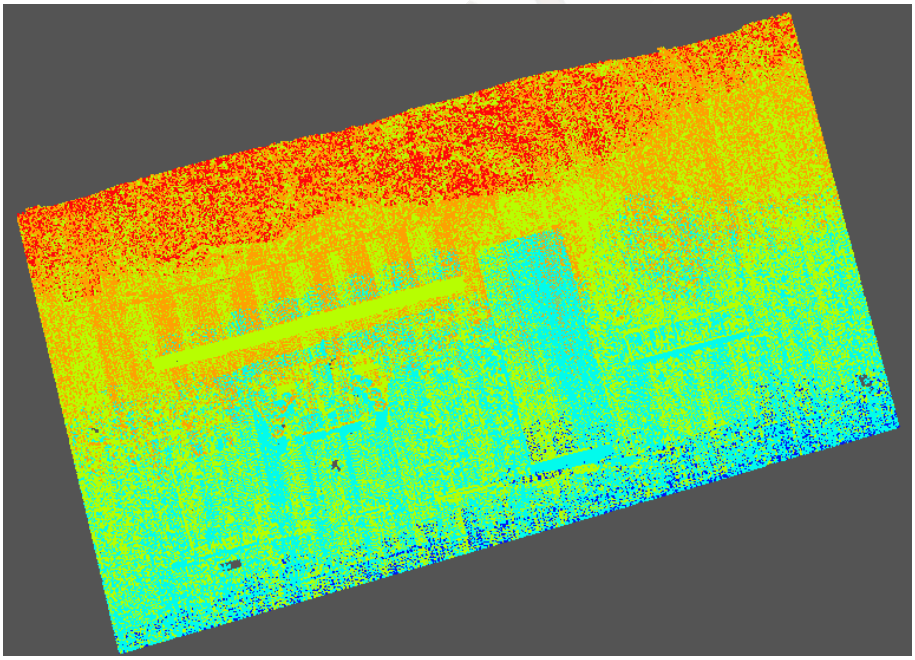


Figure: Source ID Rendering Effect

② Select different color strips in the color strip as needed; click Rendering Settings, drag the scroll bar or scroll the wheel to modify the maximum and minimum values of the source ID range, and you can view the source ID rendering effect in real time. Reset is used to restore the default values.

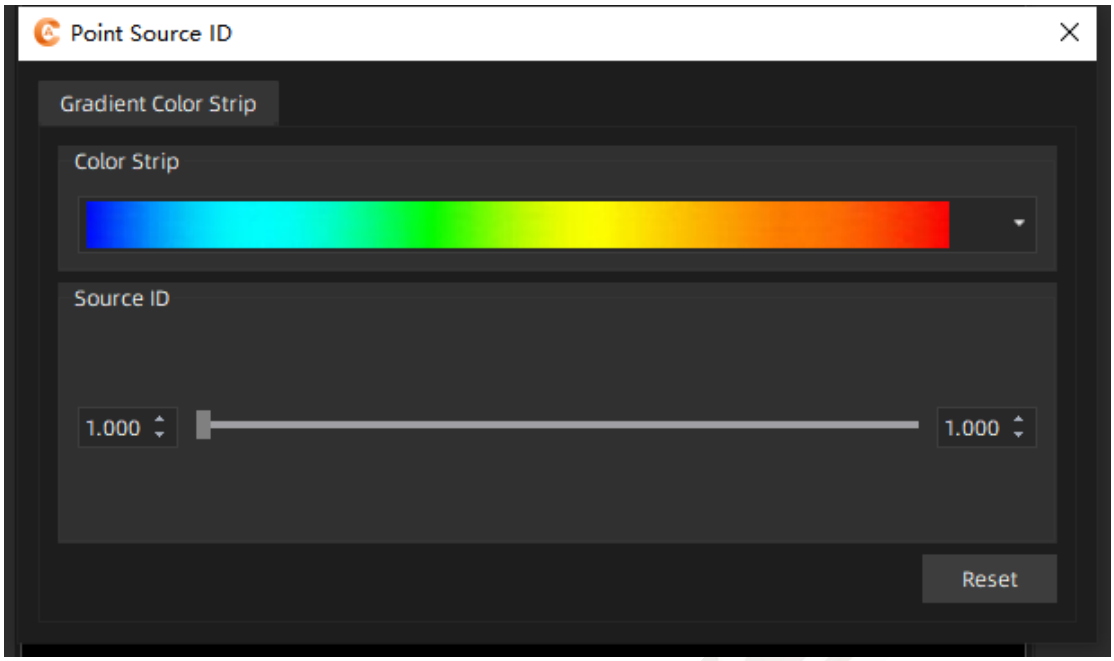


Figure: Source ID Rendering Effect

2.1.1.2 Point Size

Function Description:

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

Operation Steps:

Click 3D View Toolbar -> Set Point Size, scroll the mouse wheel, scroll up to increase the point size, scroll down to decrease the point size, or directly enter the point size value to change the point size. The point size adjustment effect is displayed in the view window in real time.

Figure: Point Size Settings

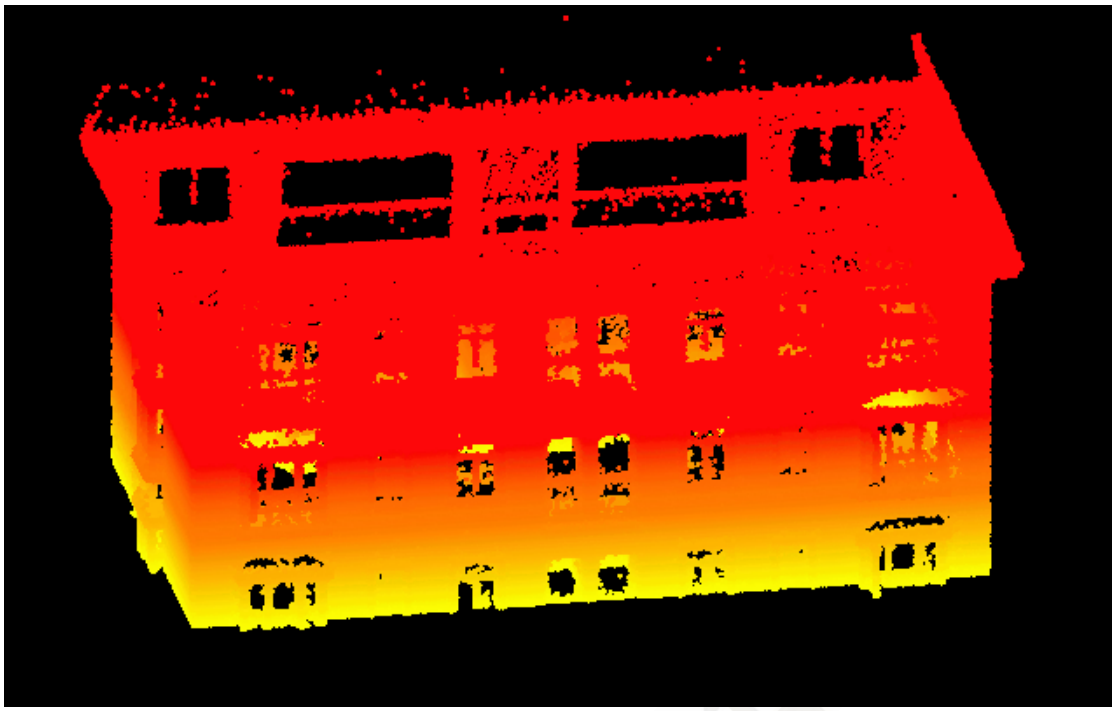


Figure: Point Size 3

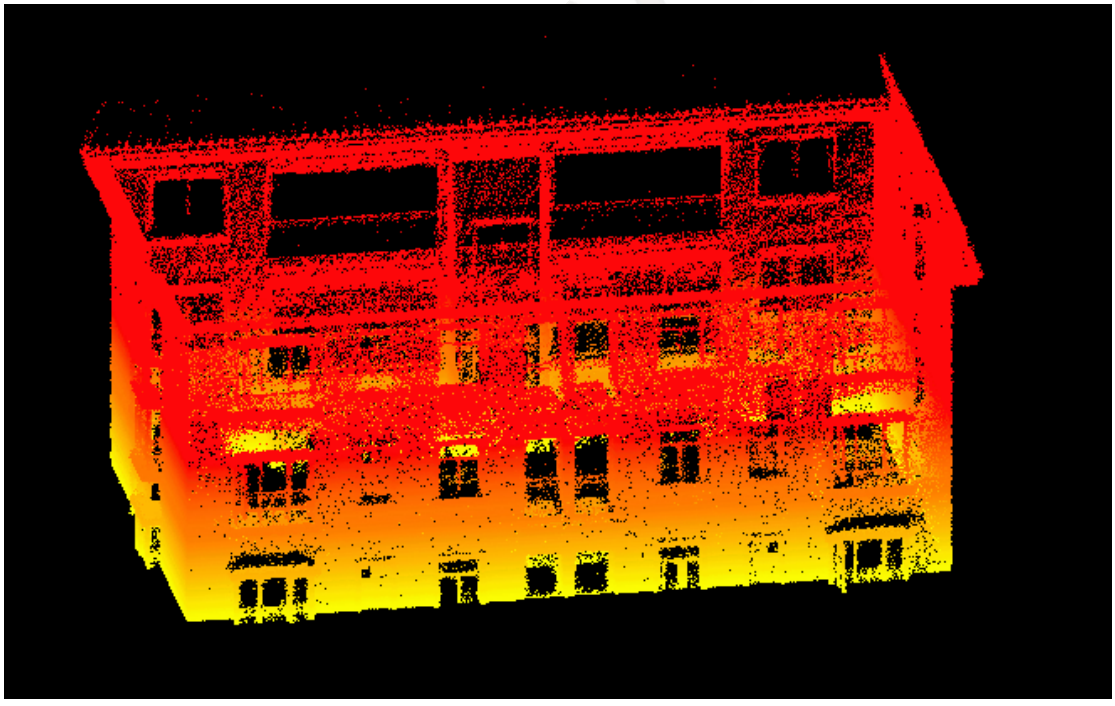


Figure: Point Size 1

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

2.1.1.3 Opacity Setting

Function Description:

Adjust the opacity of the point cloud data in the view.

Operation Steps:

Click 3D View Toolbar -> Opacity Setting, scroll the mouse wheel, scroll up to increase the point cloud opacity, scroll down to decrease the point cloud opacity, or directly enter the opacity value to change the point cloud opacity. The adjustment effect is displayed in the view window in real time.

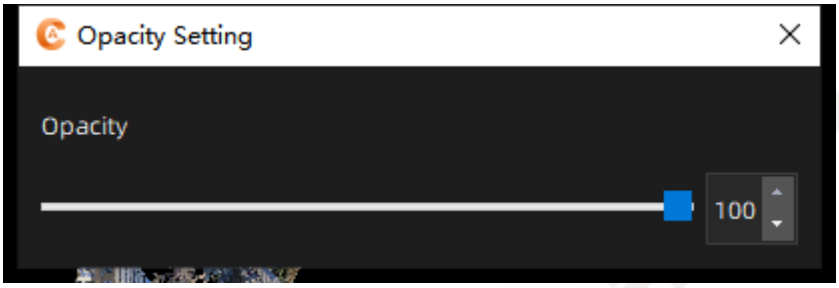


Figure: Opacity Settings

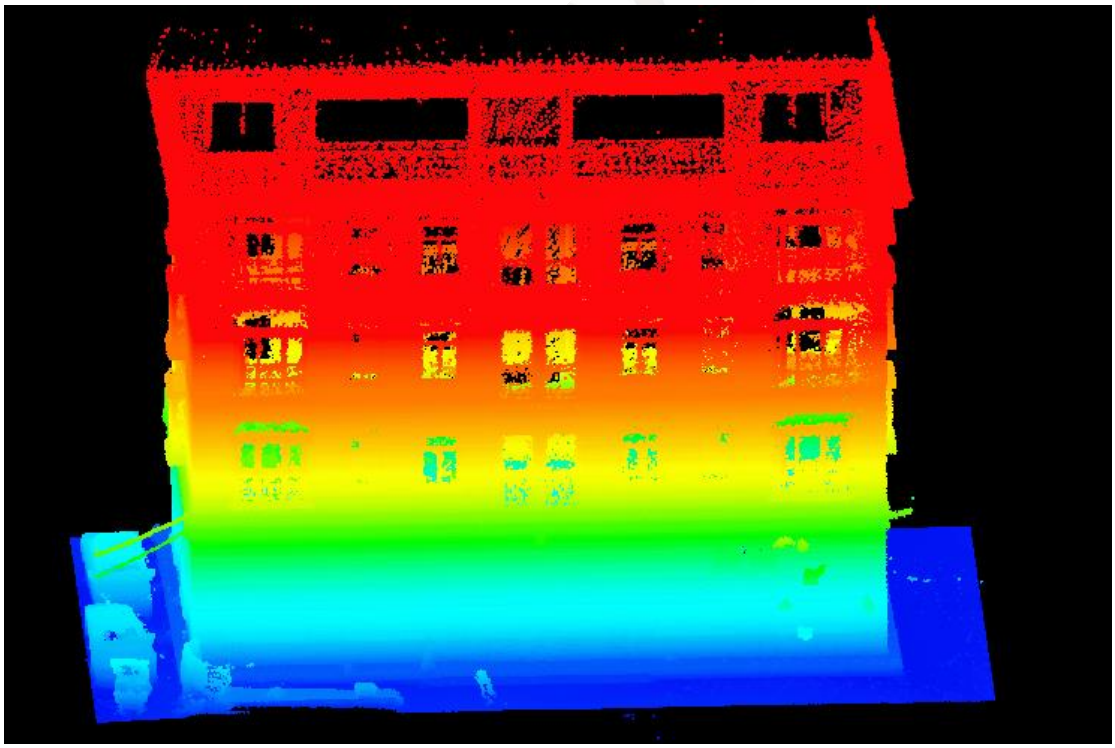


Figure: Opacity 100%

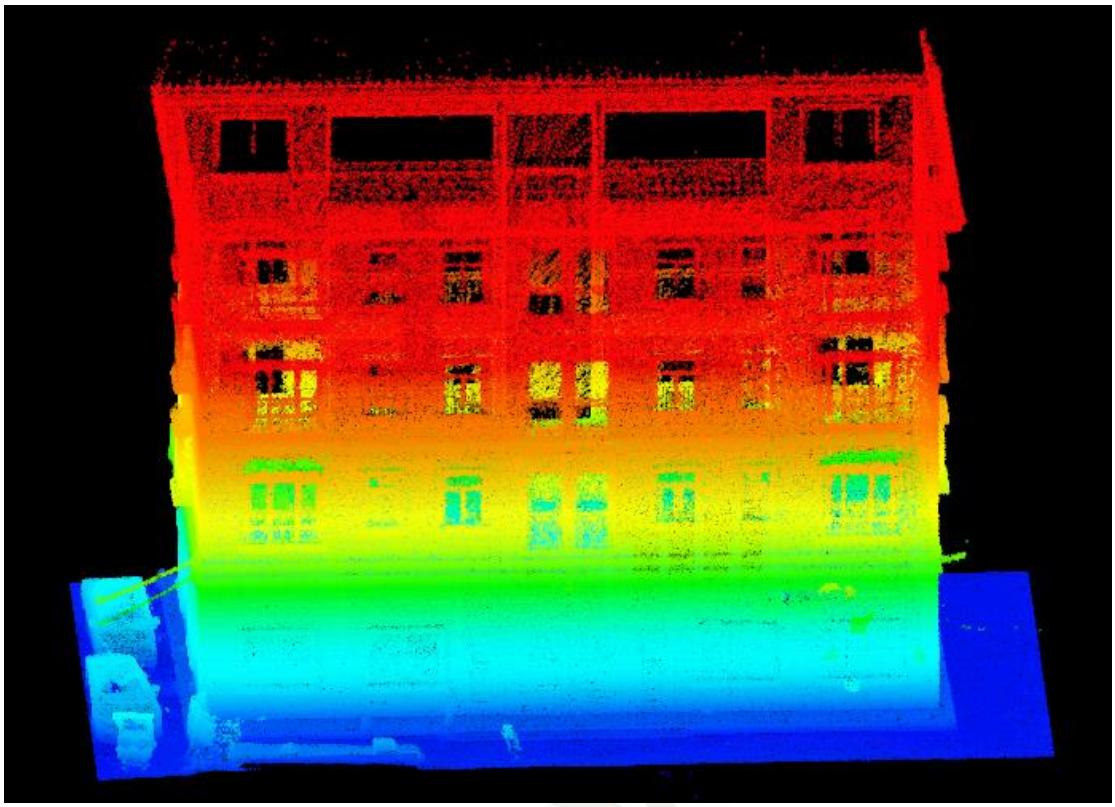


Figure: Opacity 50%

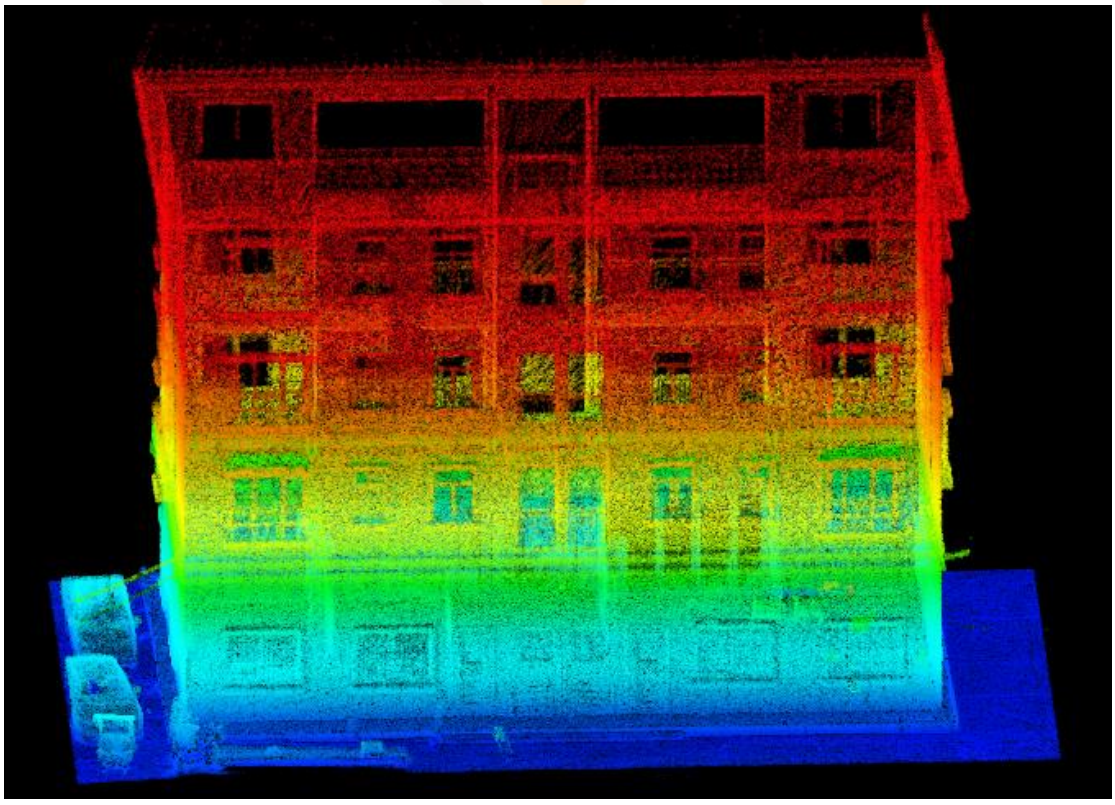


Figure: Opacity 20%

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

2.1.1.4 Wireframe Rendering

Function Description:

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

Operation Steps:

Click 3D View Toolbar -> Wireframe to switch the display and closing of the wireframe, which is closed by default.

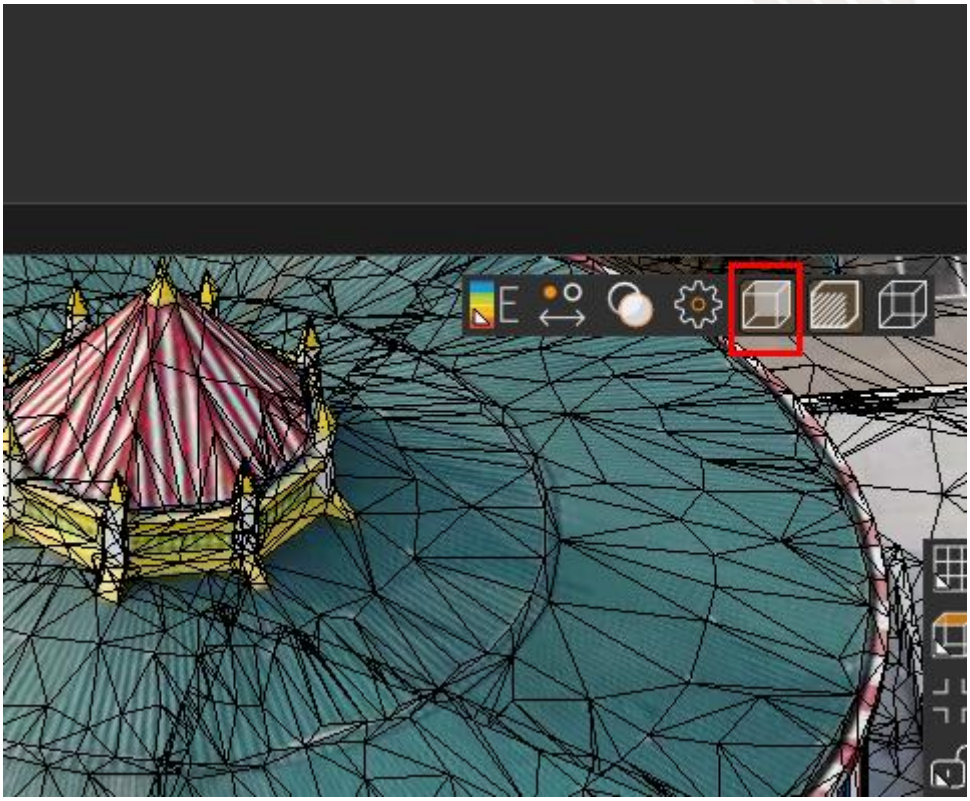


Figure: 3D View Wireframe Rendering

2.1.1.5 Texture Rendering

Function Description:

Switch for texture display of OSGB model data in the view.

Operation Steps:

Click 3D View Toolbar -> Texture to switch the display and closing of the texture, w

hich is open by default.

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 wireframe-only mode is enabled, the model only displays the wireframe part.

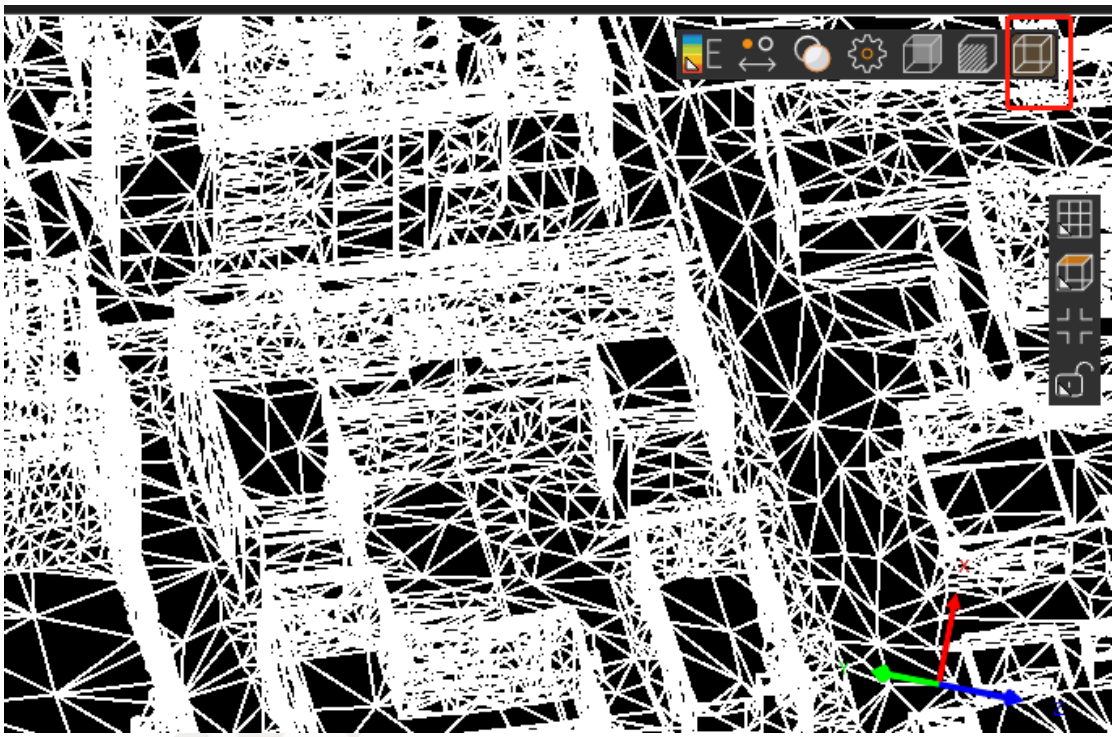


Figure: 3D View Wireframe-Only Rendering

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 th e 3D view.

Figure: 3D Real-Time Coordinate Axis

2.1.1.8 View Angle

Define the projection mode of the data in the view, including orthographic, perspectiv e, and 2D.

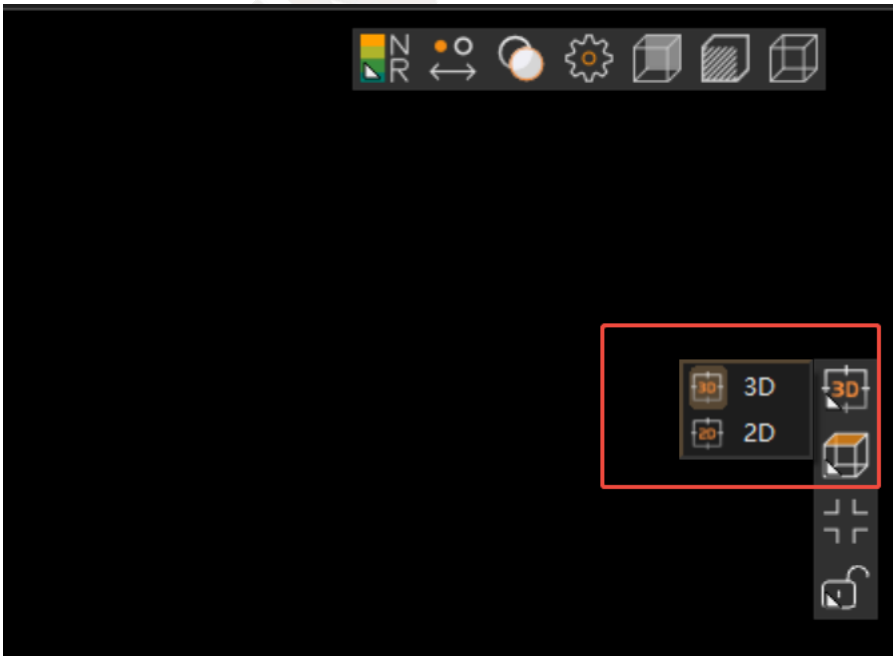


Figure: View Angle Function Entry

2.1.1.8.1 3D View

In 3D view, the projection mode of objects in the view is orthographic project ion. Orthographic projection, also known as parallel projection, ensures that the size and dimensions of the object remain unchanged after projection, regardless of how far the object is from the camera.

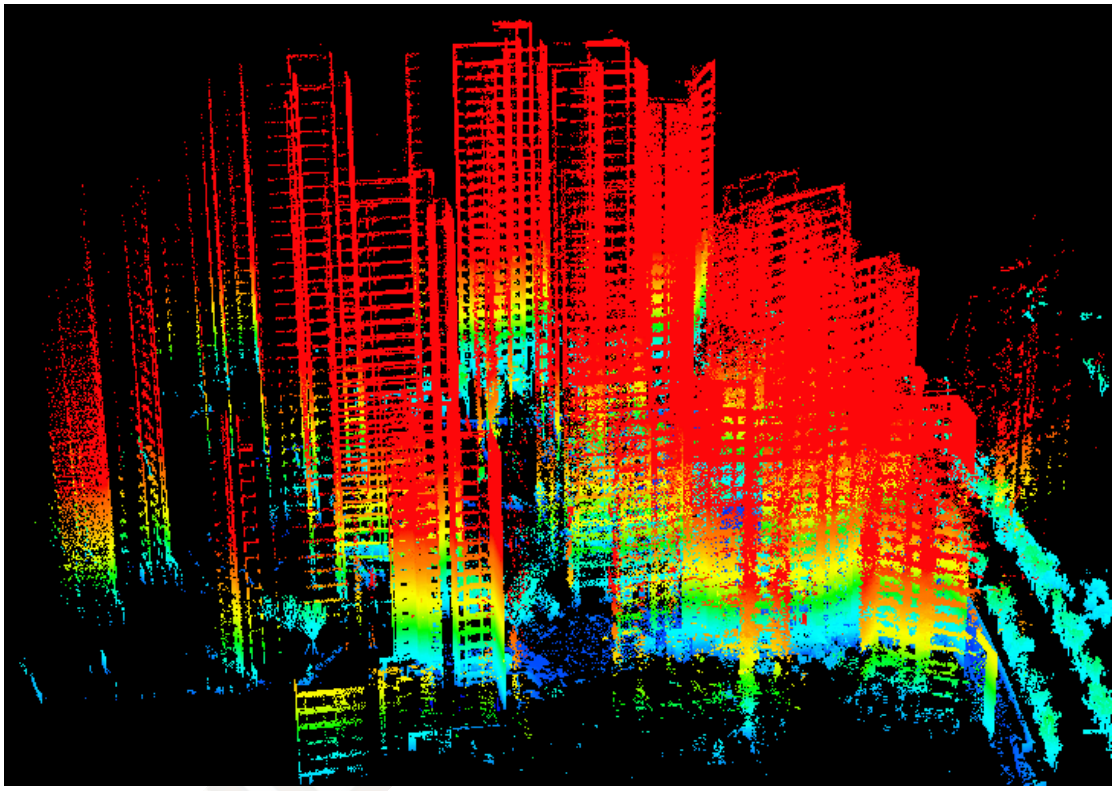


Figure: 3D View

2.1.1.8.2 2D View

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

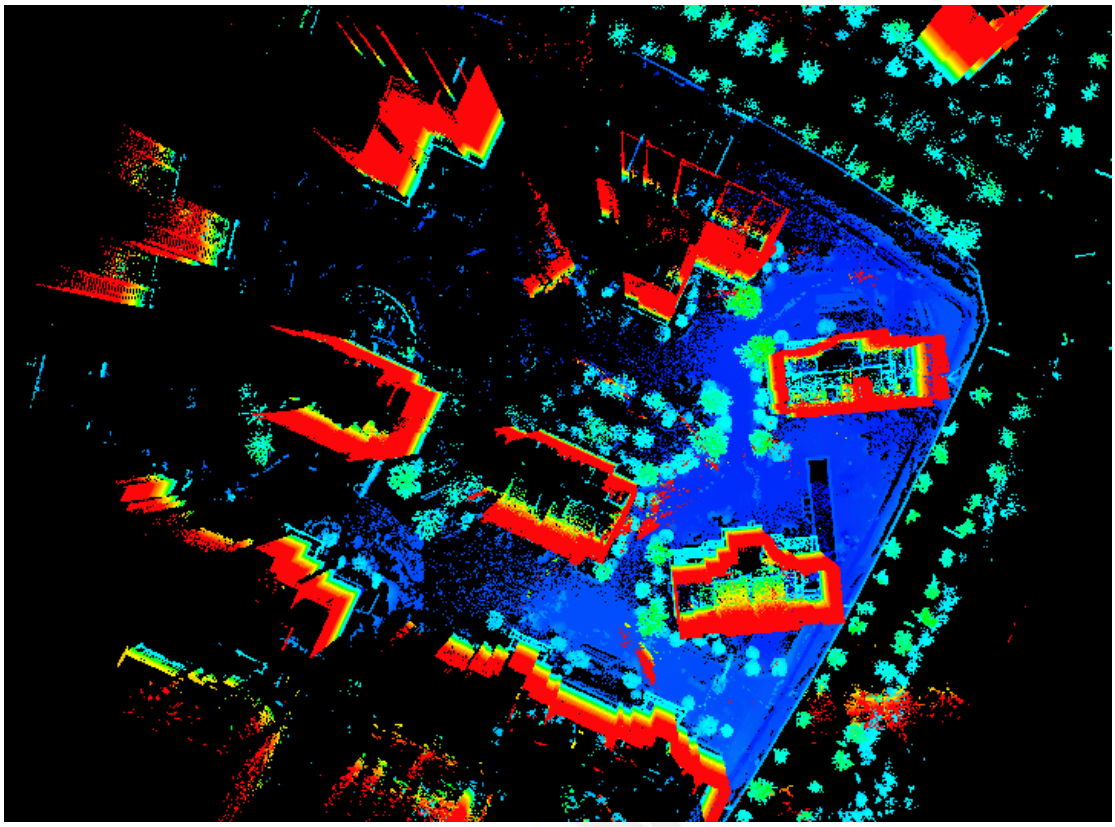


Figure: 2D Projection

2.1.1.9 View Direction

This section introduces the view direction. Click to select the view direction, and the data in the view can present six different direction perspectives: front view, back vie w, left view, right view, top view, and bottom view.

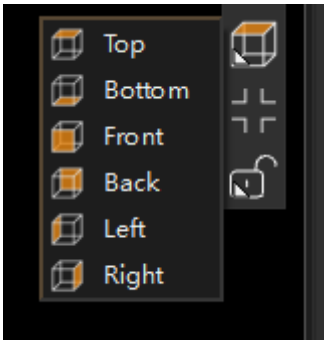


Figure: View Direction

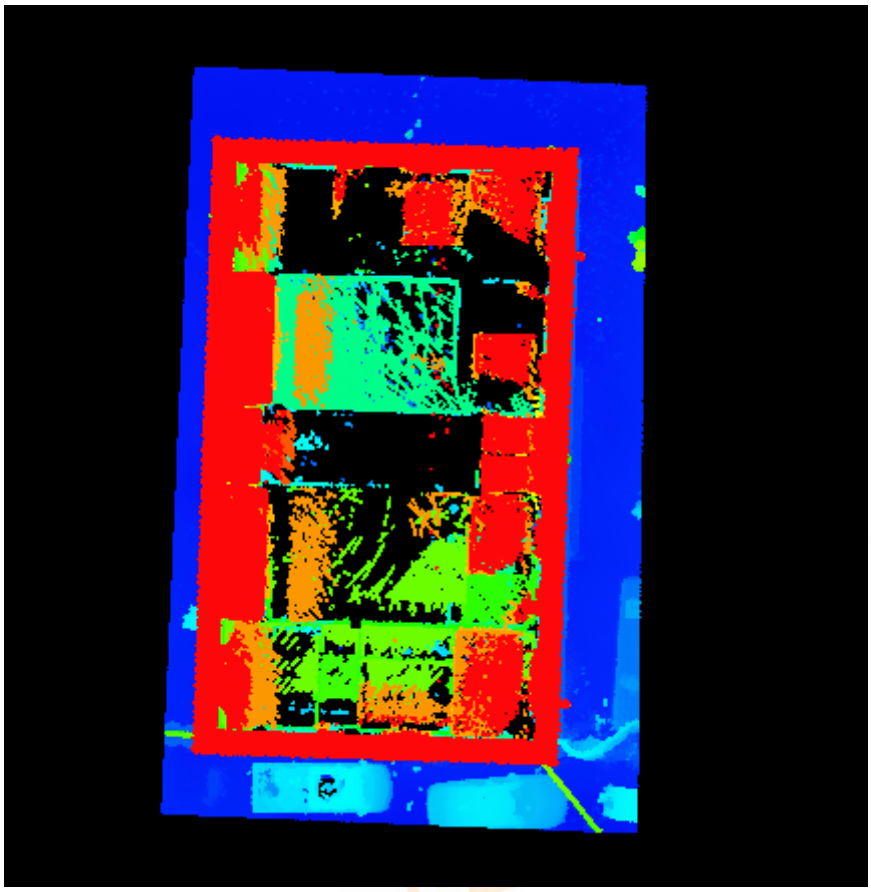


Figure: Top View

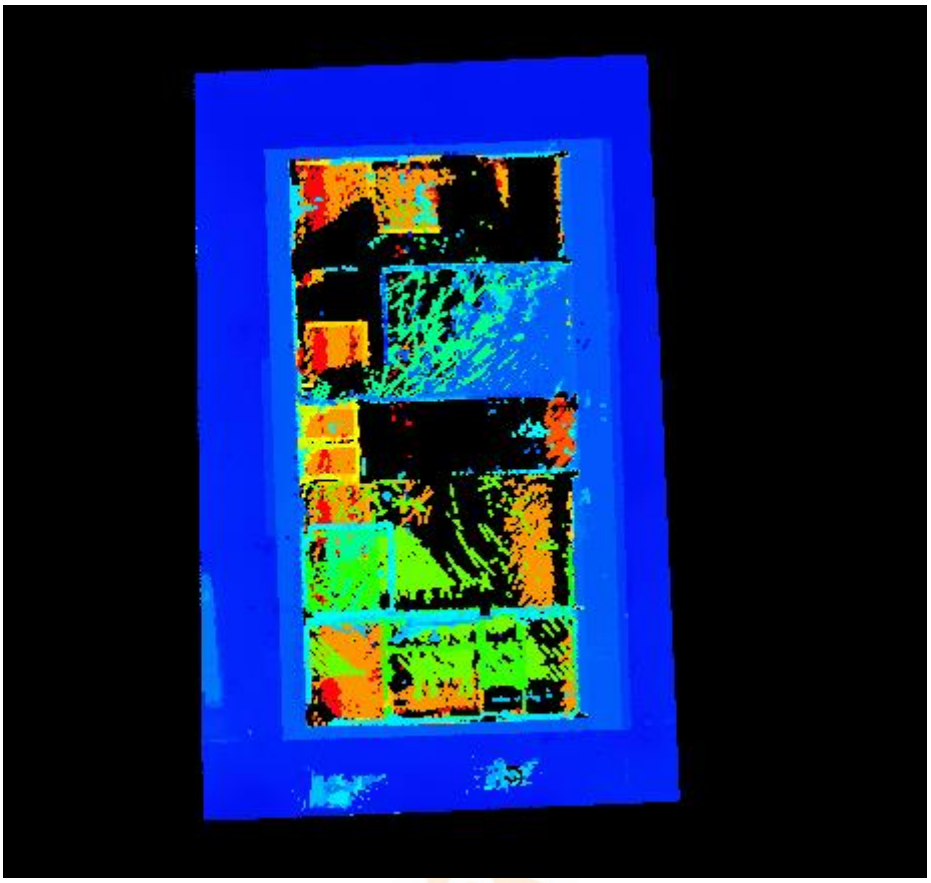


Figure: Bottom View

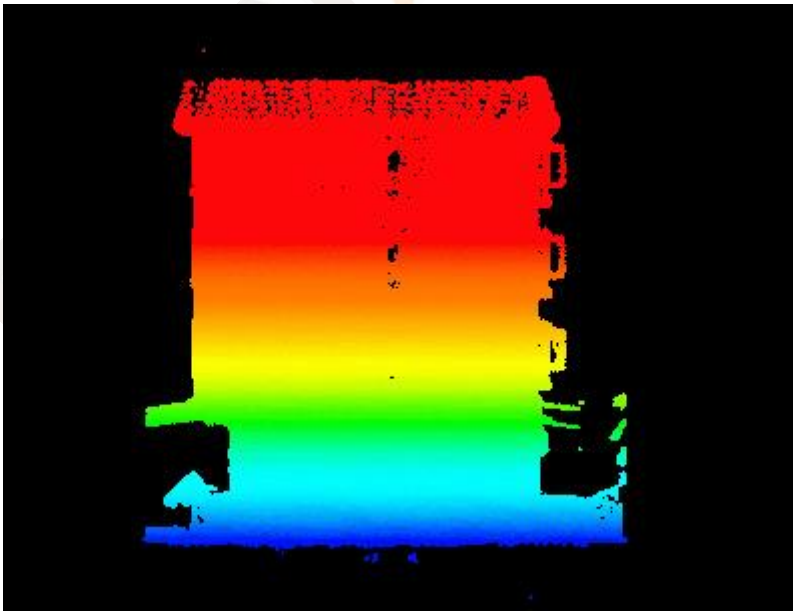


Figure: Front View

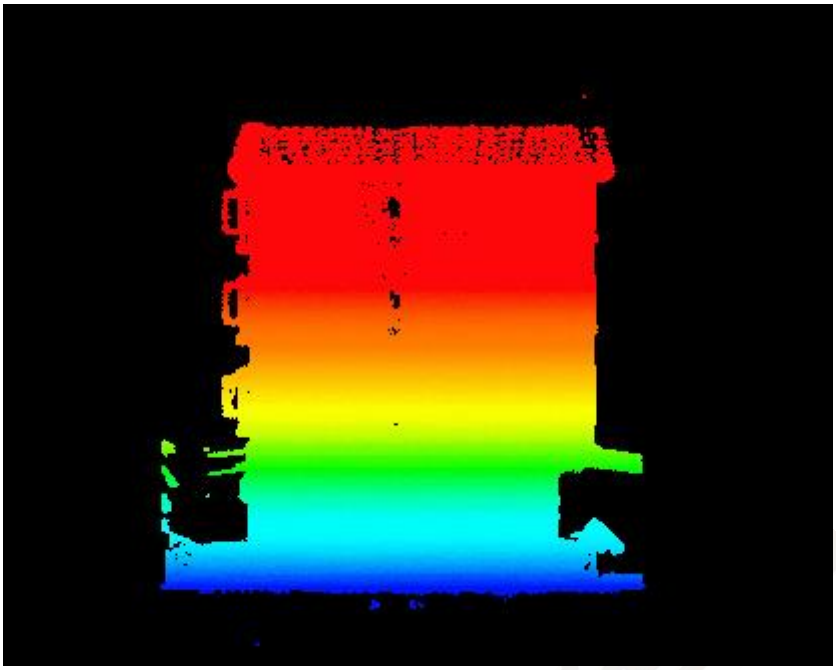


Figure: Back View

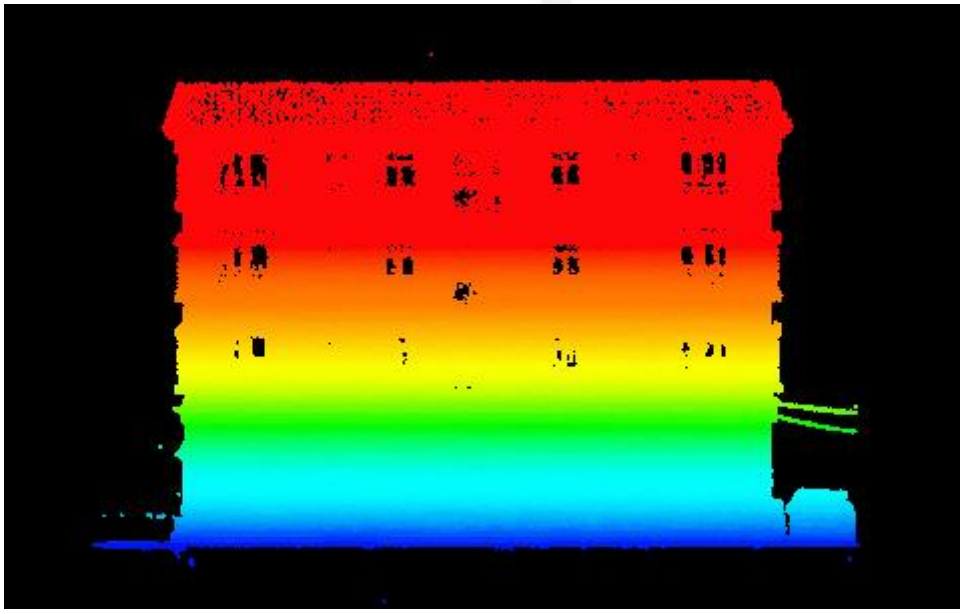


Figure: Left View

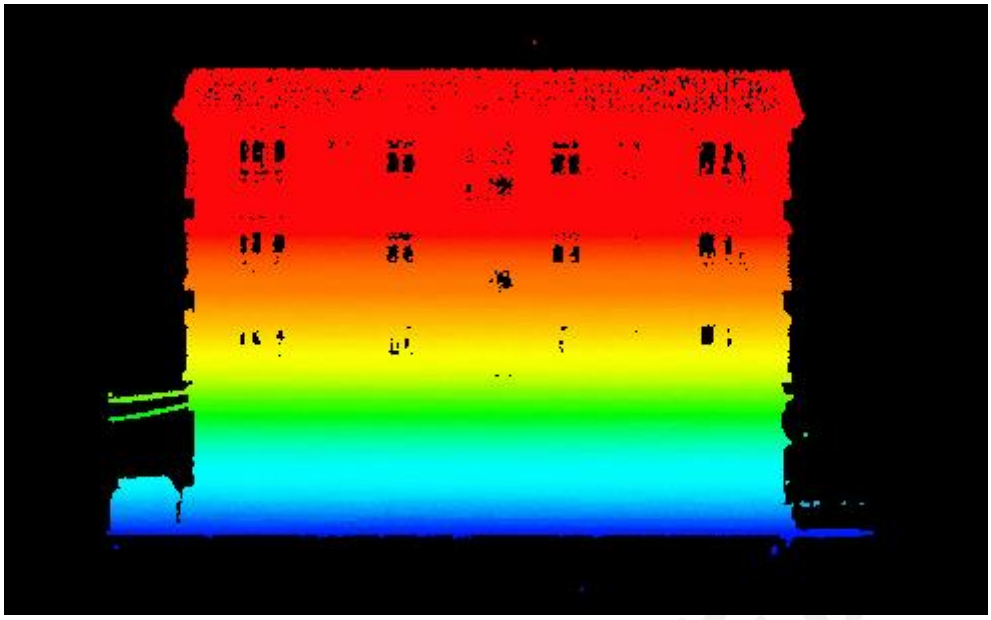


Figure: Right View

2.1.1.10 Center Display

Function Description:

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

Operation Steps:

① For data after executing zoom in, zoom out, or pan commands, click 3D View To olbar -> 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 windo w for display.

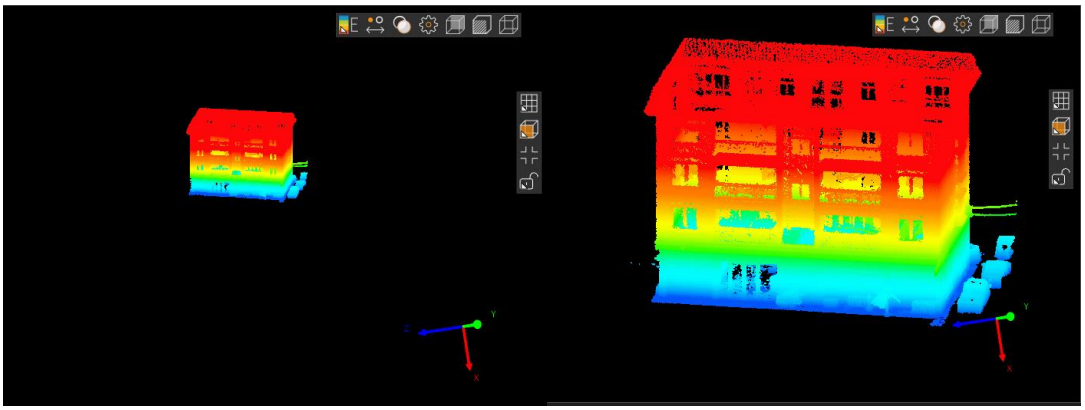


Figure: Comparison Before and After Centering

2.1.1.11 Pan

Pan the data in the view. Press and hold the right mouse button to drag and pan the objects in the view.

2.1.1.12 Rotate

Rotate the data in the view. Press and hold the left mouse button to drag and rotate t he objects in the view.

2.1.1.13Zoom In

Enlarge the display of data in the view. Scroll the mouse wheel upward to zoom in o n the data.

2.1.1.14Zoom Out

Reduce the display of data in the view. Scroll the mouse wheel downward to zoom o ut on the data.

2.1.1.15 View Lock

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

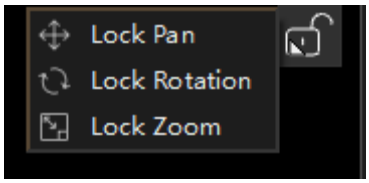


Figure: Lock View

2.1.1.15.1 Lock Pan

Activate the lock pan function, and the data objects in the view cannot be panned.

2.1.1.15.2 Lock Rotate

Activate the lock rotate function, and the data objects in the view cannot be rotated.

2.1.1.15.3 Lock Zoom

Activate the lock zoom function, and the data objects in the view cannot be zoomed.

2.1.2 Toolbar of facade View

Function Description:

There are two sets of horizontal and vertical toolbars in the façade view toolbar, fixed in the upper right area of the facade view window. The functions in the horizontal toolbar from left to right are switch facade view, facade parameter setting, Vector unfolding, facade export, point cloud rendering mode, point size setting, opacity setting, point cloud rendering setting, model wireframe rendering, model texture rendering, and model wireframe-only rendering. The functions in the vertical toolbar from top to bottom are center display and view lock.

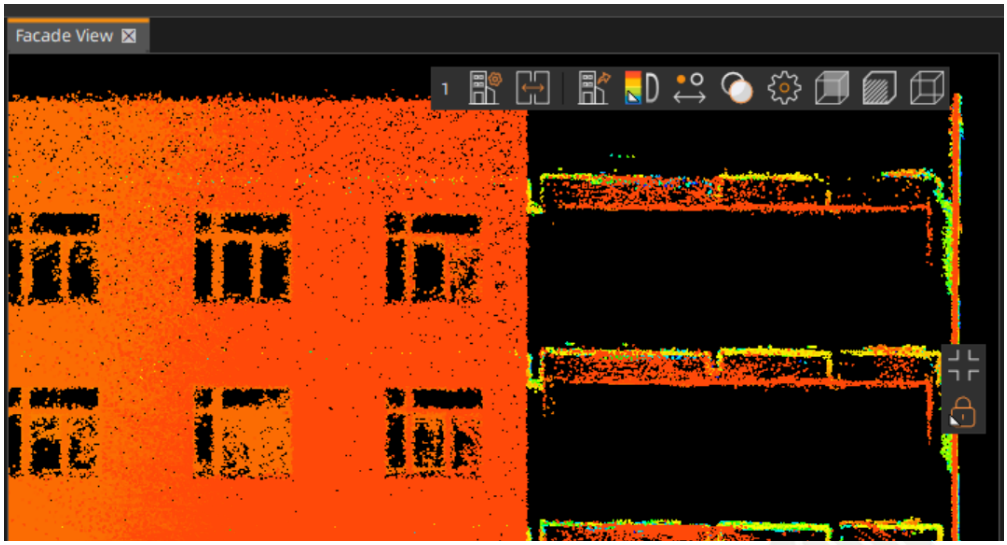


Figure: Toolbar in the Elevation View

Operation Steps:

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

2.1.2.1 Swtich Facade

Function Description:

Switch elevation perspectives.

Operation Steps:

① When the current facade view is a four-view, click the first button in the horizontal toolbar of the facade view, and click "Front, Left, Back, Right" in the drop-down box to switch the display of point cloud and vector data in different directions of the facade view.

Figure: Elevation Switch - Four-View

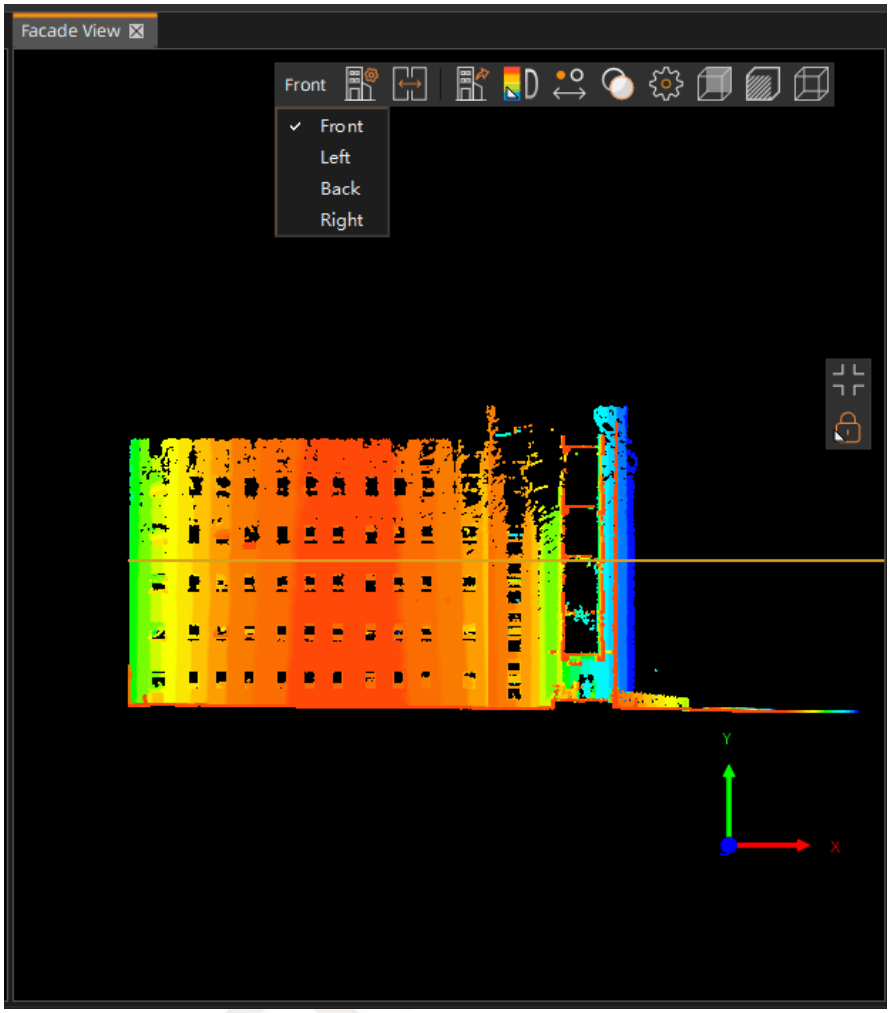
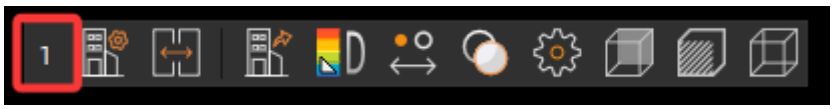


Figure: Elevation View - Four-View

② When the current facade view is a front view, click the first button in the horizontal toolbar of the facade view, and click different numbers in the drop-down box to switch the display of point cloud and vector data on different sides of the facade view.



Figure：facade Switch - Front View

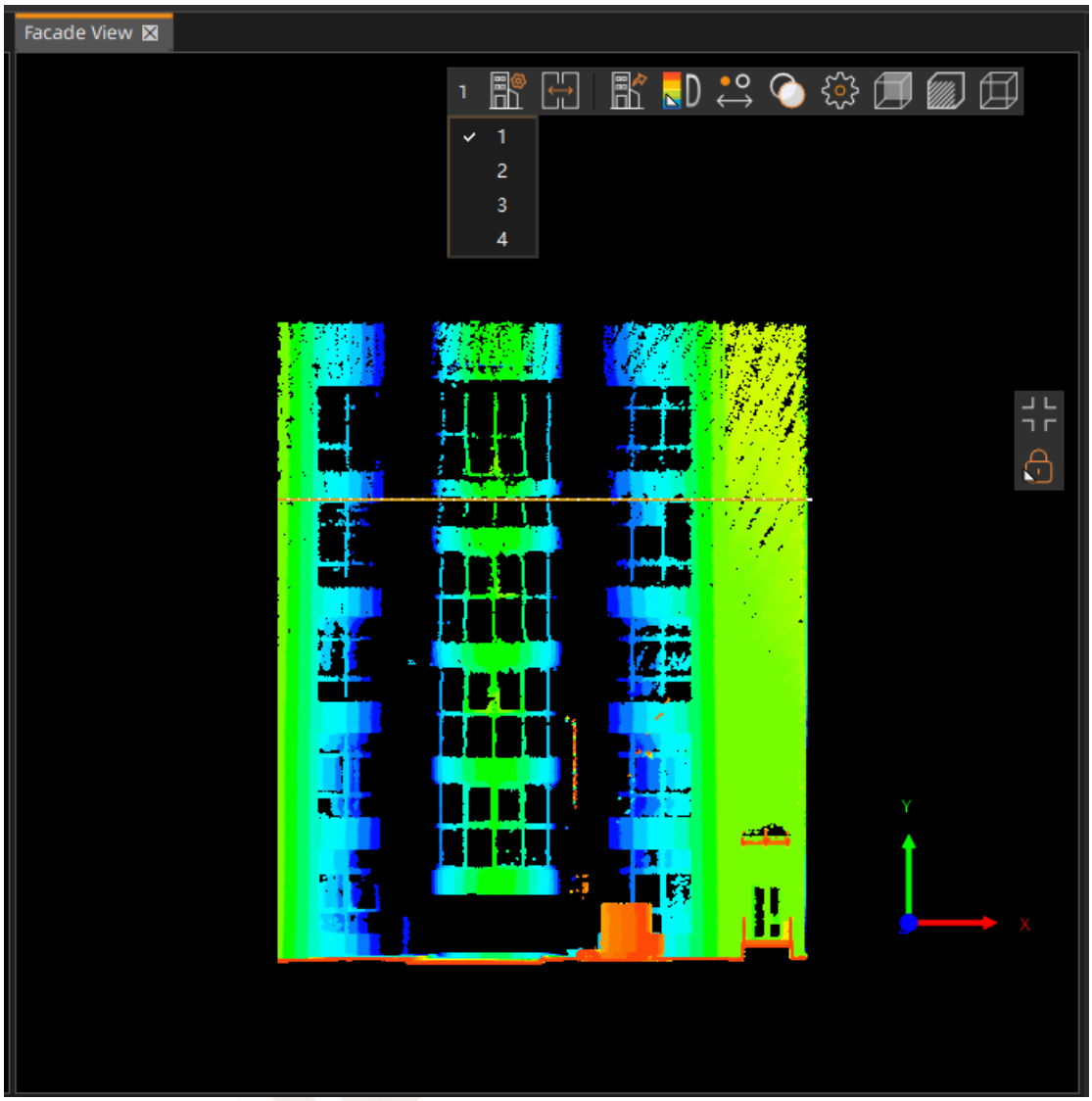


Figure: Elevation View - Front View

2.1.2.2 Facade Parameter Setting

Function Description:

Set the thickness, and expansion of the current facade.

Operation Steps:

① Click the facade parameter setting button to pop up a dialog box. You can modify the parameter values by entering numbers, scrolling the wheel, or clicking the up and down arrow buttons.

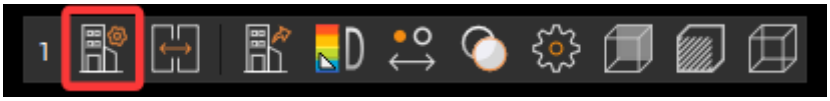


Figure: Facade Parameter Setting

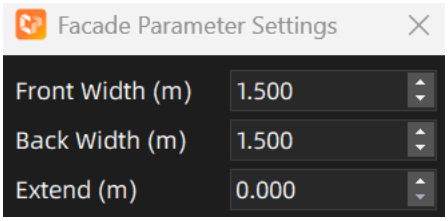


Figure: Facade Parameter Setting Dialog Box

Front Width (m): The width of the facade proxy line in the 3D view from the center line outward (the facade proxy line in the front view is to the right) when viewed from the top. The default value is 1.5m, and the setting range is [0.001, 100]. After modification, the data in the facade view is displayed as the range covered by the facade proxy line in the 3D view when viewed from the top.

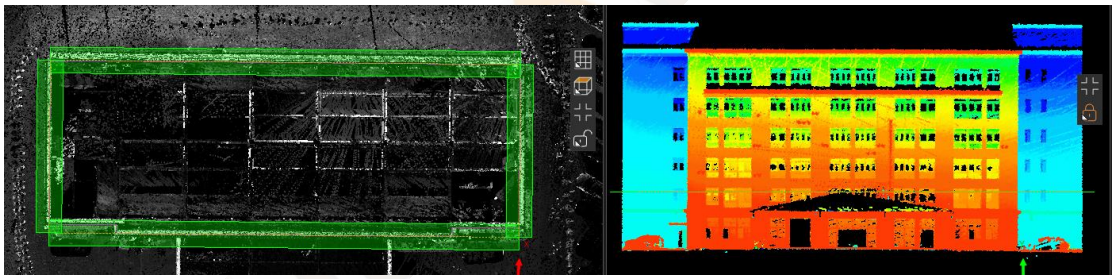


Figure: Front Width 1.5m

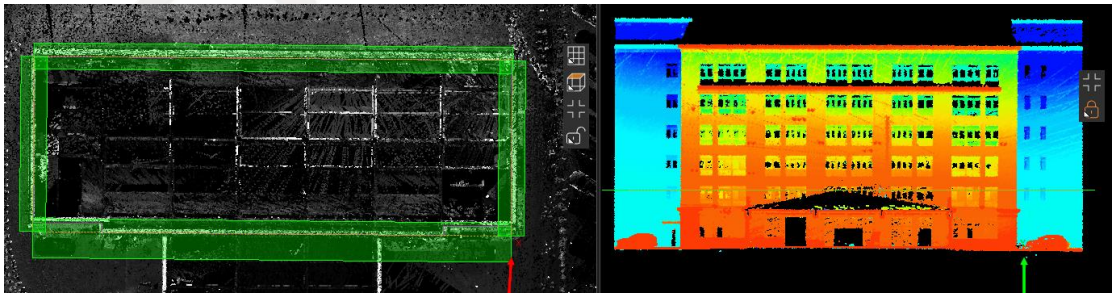


Figure: Front Width 3m

Back Width (m): The width of the facade proxy line in the 3D view from the center line inward (the facade proxy line in the front view is to the left) when viewed from the top. The default value is 1.5m, and the setting range is [0.001, 100]. After mo

dification, the data in the facade view is displayed as the range covered by the façad e proxy line in the 3D view when viewed from the top.

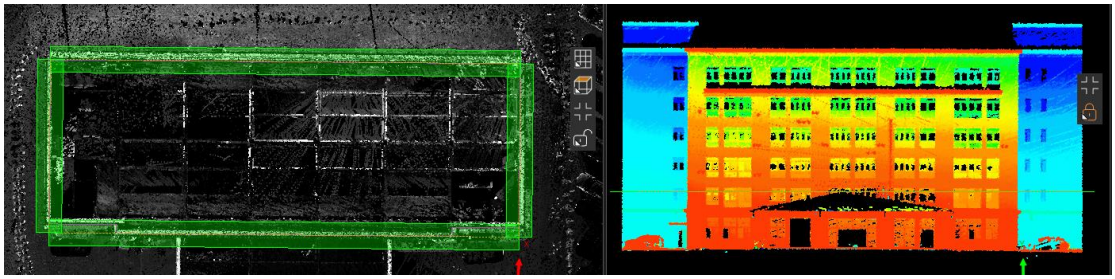


Figure: Back Width 1.5m

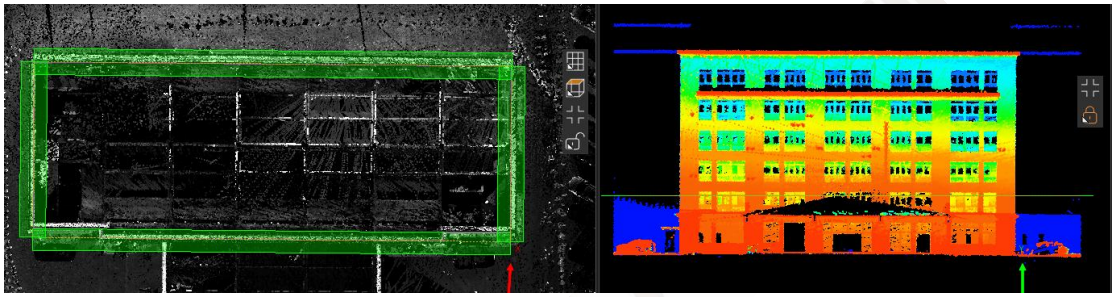


Figure: Back Width 1m

Extend (m): The width of the facade proxy line expanded outward at both ends along the center line. The default value is 0m, and the setting range is [0, 100]. After mo dification, the data in the facade view is displayed as the range covered by the facad e proxy line in the 3D view when viewed from the top.

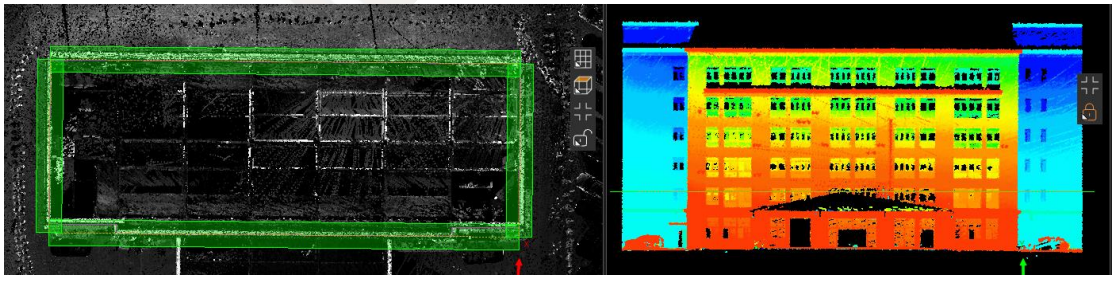


Figure: Expansion 0m

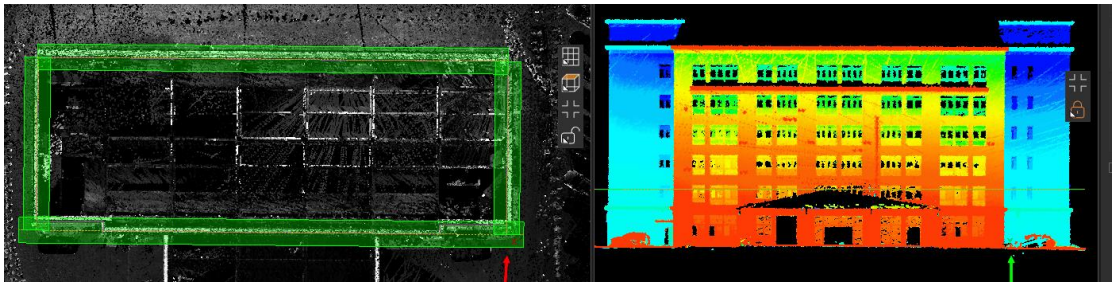


Figure: Expansion 2m

2.1.2.3 Vector Unfolding

Function Description:

Unfold the vector features of adjacent facades and display them in the current facade view.

Operation Steps:

Left-click the vector unfolding button in the toolbar of the facade view to switch between open and closed states (highlighted state is open, non-highlighted state is closed)

Figure: Vector Unfolding

The vertical height of the unfolded facade is determined by the bounding box height of the total data in the software, the width of the vector unfolding is determined by the length of the adjacent facade proxy line, and the unfolded vector can only be snapped and cannot be edited.

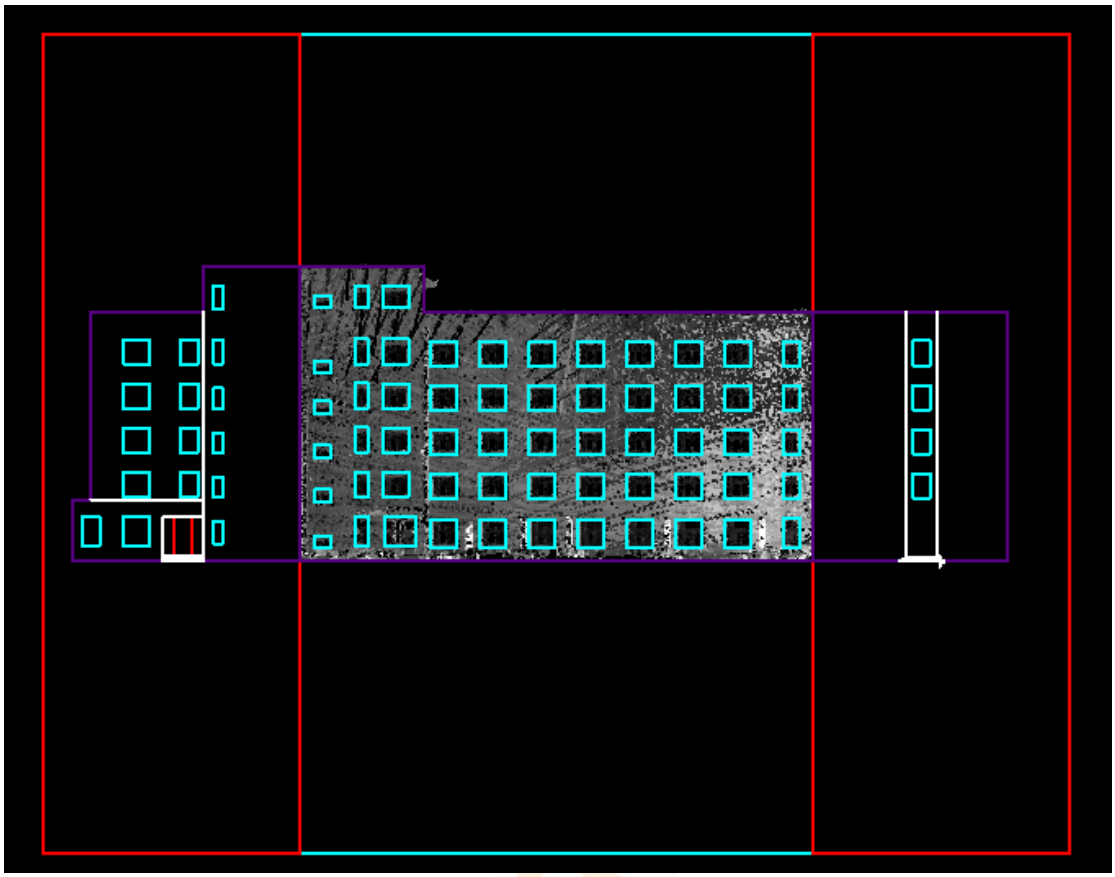


Figure: Vector Unfolding

2.1.2.4 Facade Export

Function Description:

Facede export solves the problem that high-performance computers are required to sup port 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 ortho photo or point cloud. When selecting orthophoto, the exported facade includes orthoph oto, coordinate file with the same name, dxf and dwg files with the same name.

Operation Steps:

① Left-click the facade export button in the toolbar of the facade view to pop up th e facade export dialog box.

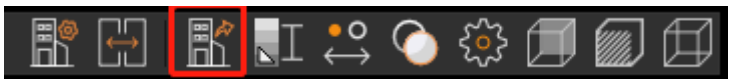


Figure: Facade Export

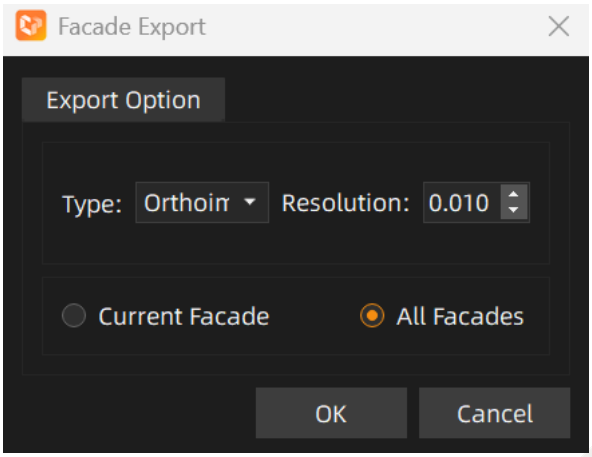


Figure: Facade Export Dialog Box

② In the facade export dialog box, you can select the objects to be exported, which are current facade and all facades. When selecting the current facade, you need to name the exported file and select the export path; when selecting all facades, yo u only need to select the export path and do not need to set the export name.

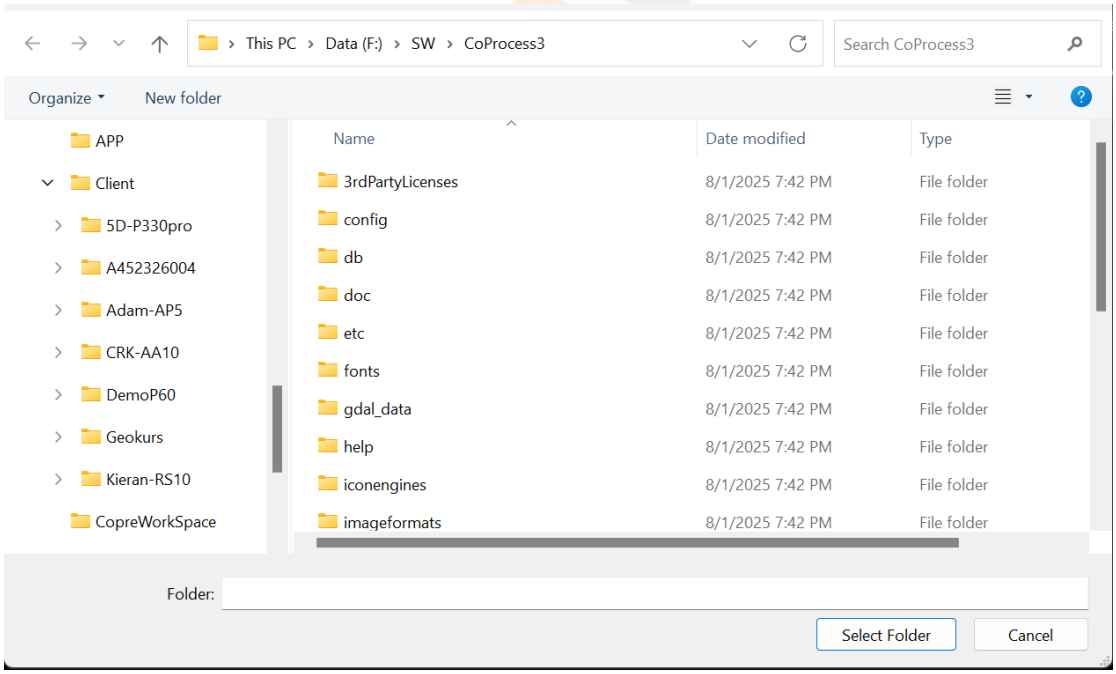


Figure: Current Facade Path Selection Dialog Box

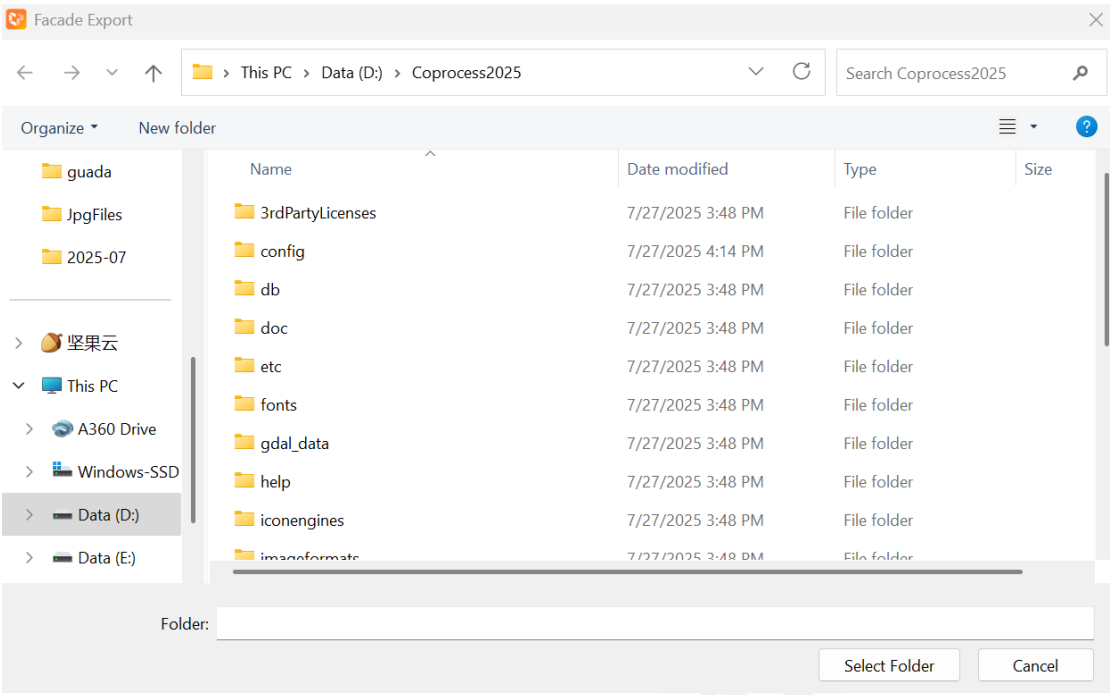


Figure: All Facades Path Selection Dialog Box

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 orthopho to 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.

Export Options:

Type: Set the data format to be exported, which includes orthophoto orpoint cloud.

Resolution: Set the resolution when exporting orthophoto. The value represents the side length of the area occupied by one pixel in the orthophoto (unit: meter; the smaller the value, the more detailed the orthophoto, and the longer the export time).

Format: Select the format of the exported point cloud, which can be hpc, las1.2, las 1.3, las1.4.

Current Facade: Only the current facade is exported.

All Facades: All facades in the current proxy line are exported.

2.1.2.5 Point Cloud Rendering Mode

This section mainly introduces different point cloud rendering mode in the facade vie w. Point cloud rendering can render point clouds in different ways, facilitating users t o obtain the required information from different renderings. It mainly includes depth r endering, elevation rendering, intensity rendering, classification rendering, RGB renderi ng, blend rendering, and other rendering methods.

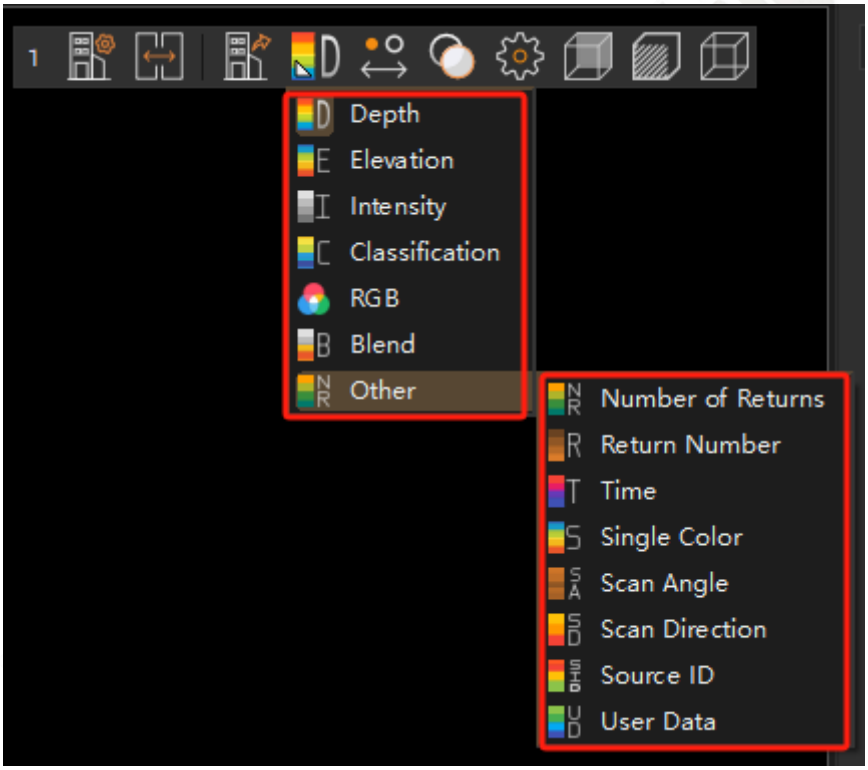


Figure: Point Cloud Rendering mode in the Facade View

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:

Map point clouds at different depths to a specified color interval according to the dep

th of the point cloud data.

Operation Steps:

① Click Facade View Toolbar -> Point Cloud Rendering -> Depth to display the depth rendering effect of the data;

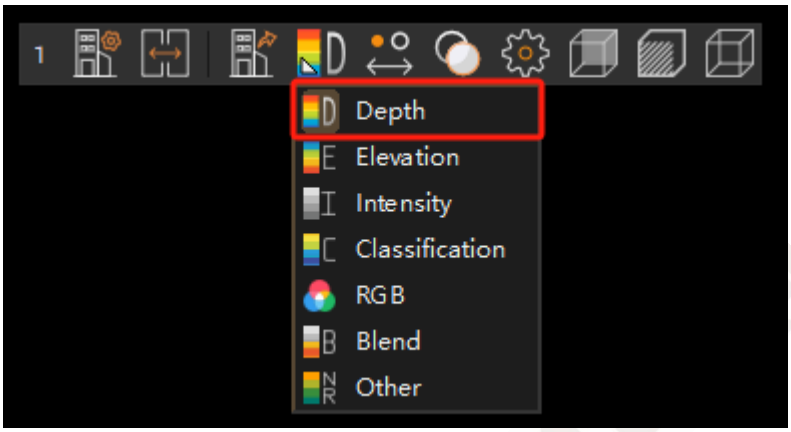


Figure: Depth Rendering Function Entry

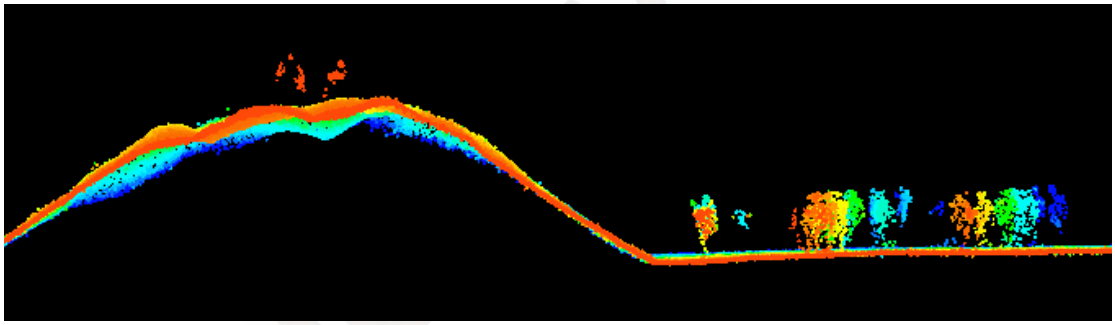


Figure: Depth Rendering

② Click Point Cloud Coloring Settings. As shown in the figure below, you can select different color strips to modify the rendering effect, and also modify the maximum and minimum values of the rendering depth range by dragging the scroll bar, scrolling the wheel, or entering numbers to modify the depth rendering effect in real time. Click the reset button in the lower right corner to restore the default values.

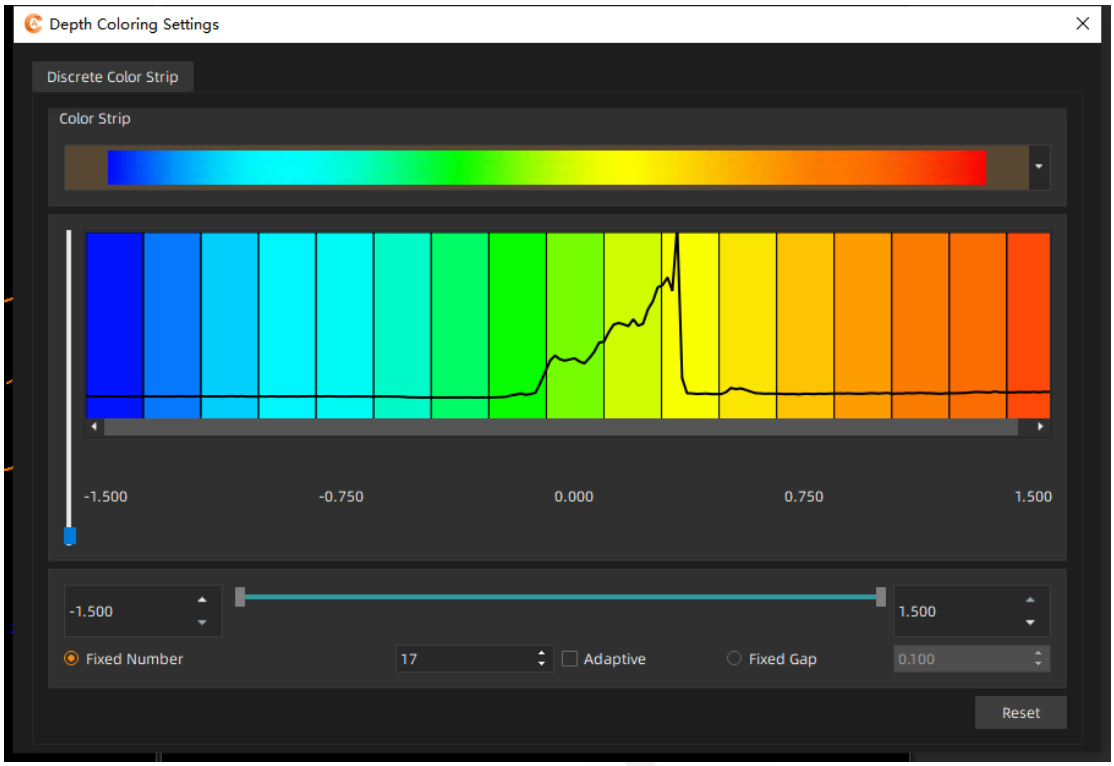


Figure: Depth Rendering Settings

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 Facade View Toolbar -> Point Cloud Rendering -> Elevation to display the elevation rendering effect of the data;

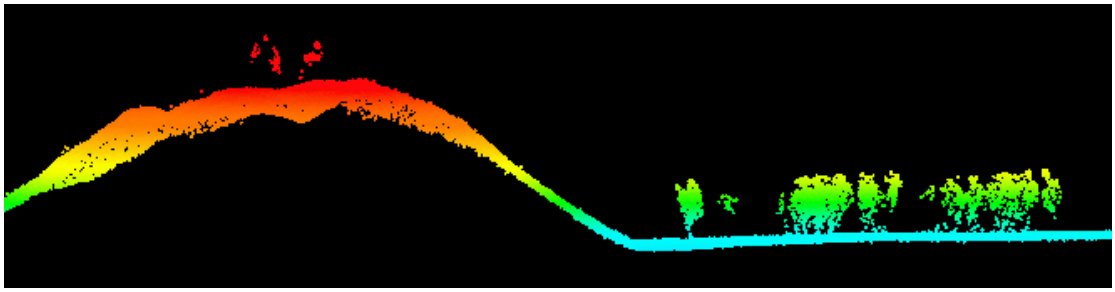


Figure: Elevation Rendering

② Click Rendering Settings. As shown in the figure below, you can select different color strips to modify the rendering style, and modify the maximum and minimum values of the elevation by dragging the scroll bar, scrolling the wheel, or entering numbers to modify the elevation rendering effect in real time. Click the reset button in the lower right corner to restore the default values.

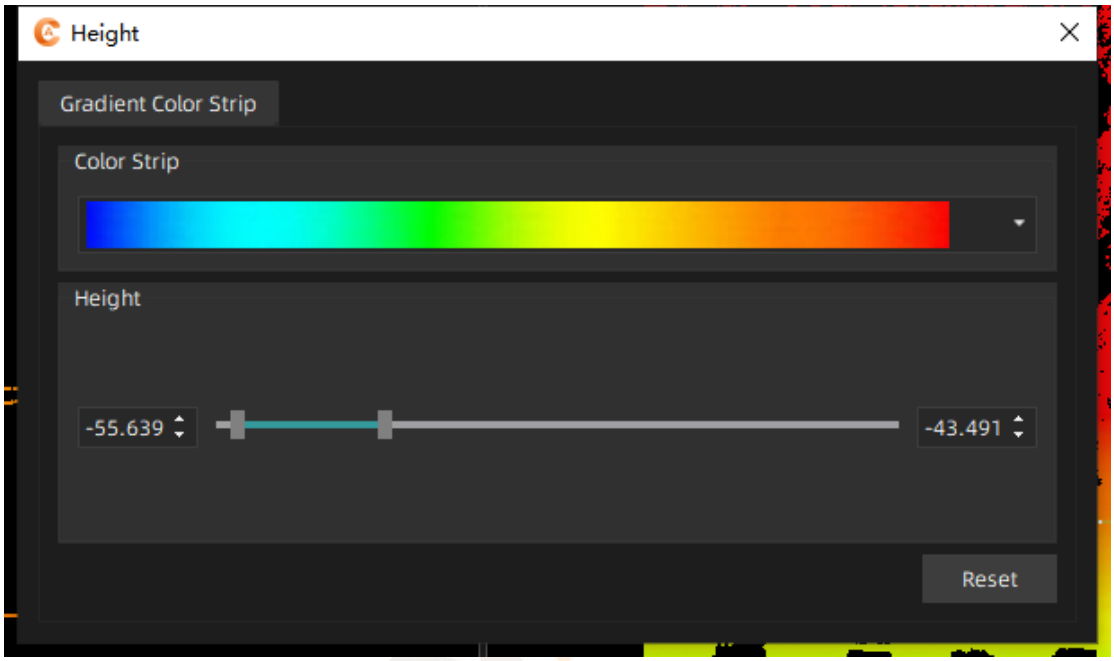


Figure: Elevation Rendering Settings

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

2.1.2.5.3 Intensity Rendering

Function Description:

Map the intensity values of the point cloud data to uniformly varying color intervals.

Operation Steps:

① Click Facade View Toolbar -> Point Cloud Rendering -> Intensity to display the intensity rendering effect of the data;

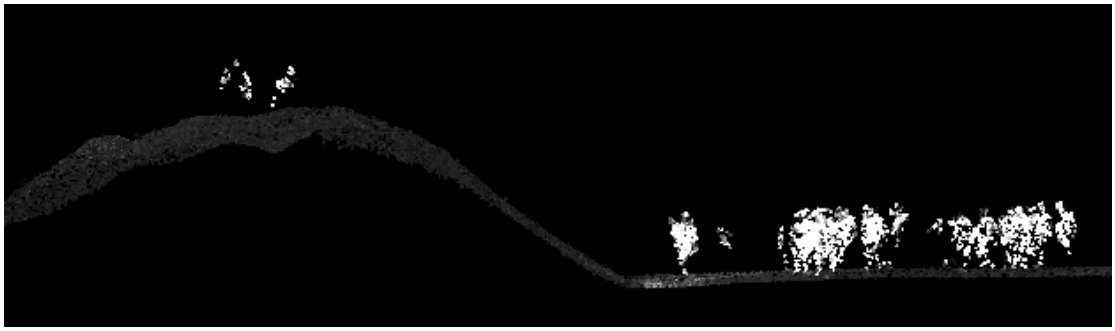


Figure: Intensity Rendering

② Click Rendering Settings. As shown in the figure below, select different color strips to use different rendering styles; drag the scroll bar, scroll the wheel to modify the intensity value, or enter numbers to modify the maximum and minimum values of the intensity to view the intensity rendering effect in real time. Click the reset button in the lower right corner to restore the default values.

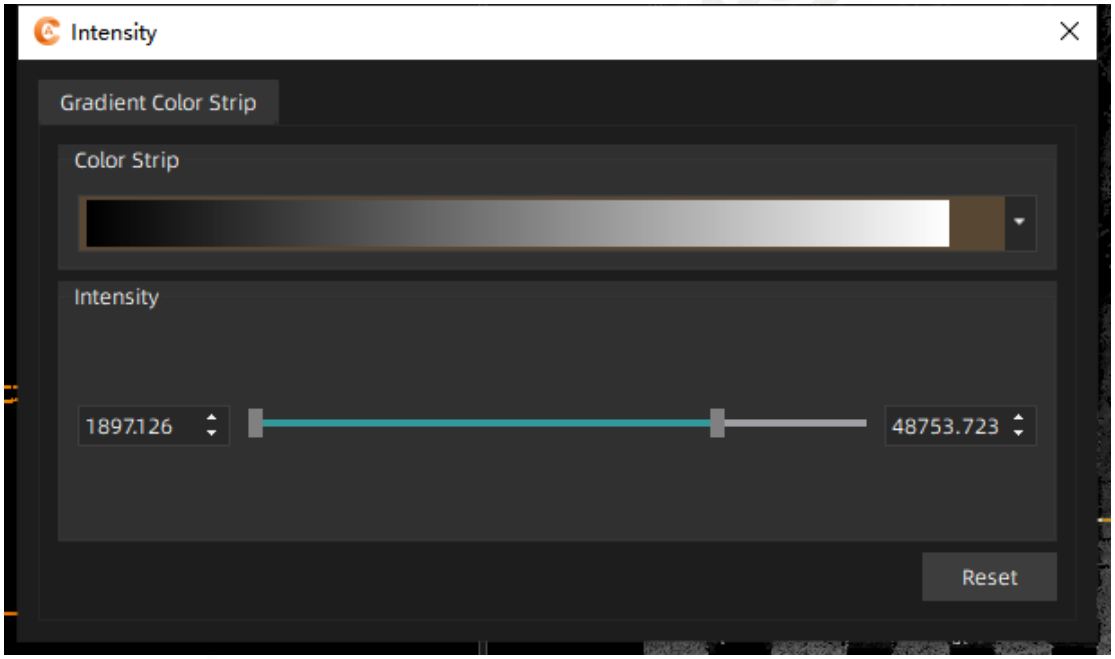


Figure: Intensity Rendering Settings

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

2.1.2.5.4 Classification Rendering

Function Description:

Map categories to different color values according to different category attributes of th

e point cloud data, facilitating intuitive differentiation of point cloud data of different categories.

Operation Steps:

① Click Facade View Toolbar -> Point Cloud Rendering -> Classification to view th e rendering effect of category display;

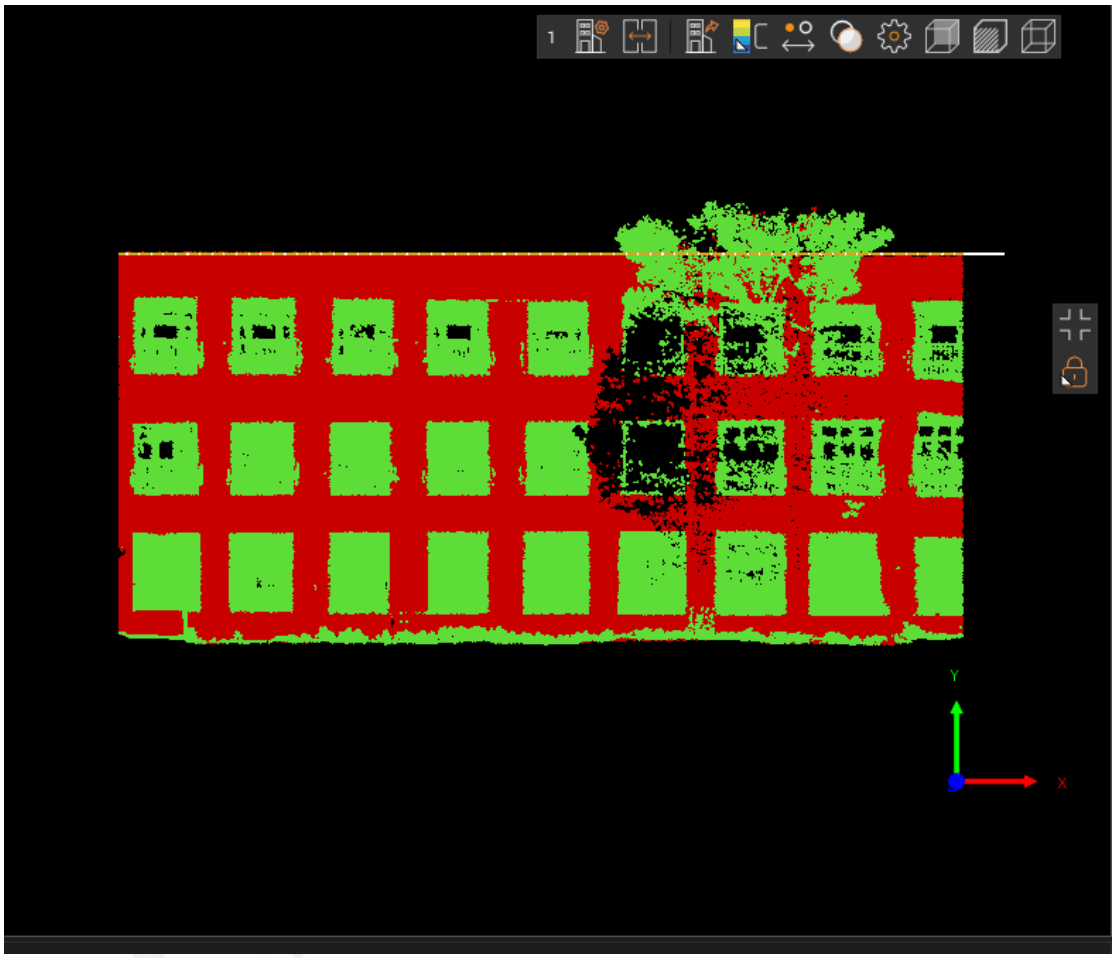


Figure: Classification Rendering

② Click Rendering Settings. As shown in the figure below, all categories are rendere d by default. Uncheck the Select All checkbox to cancel the rendering display of all categories. Uncheck the checkbox of a specific category to cancel the display of that category.

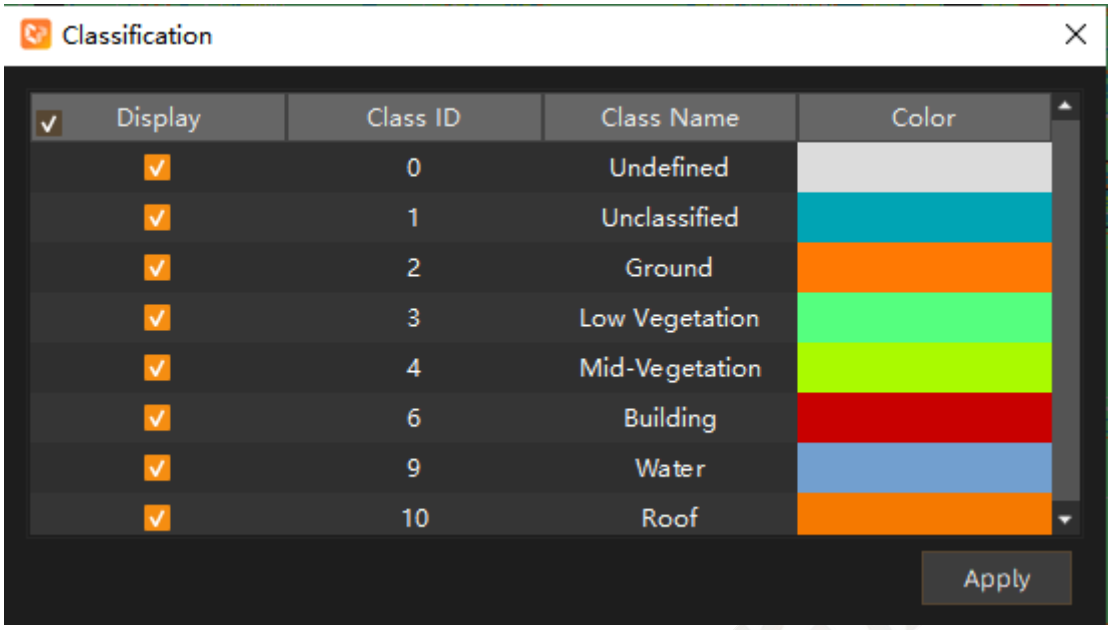


Figure: Classification Settings

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 color in the color mapping table on the right and click OK to modify the classification rendering color.

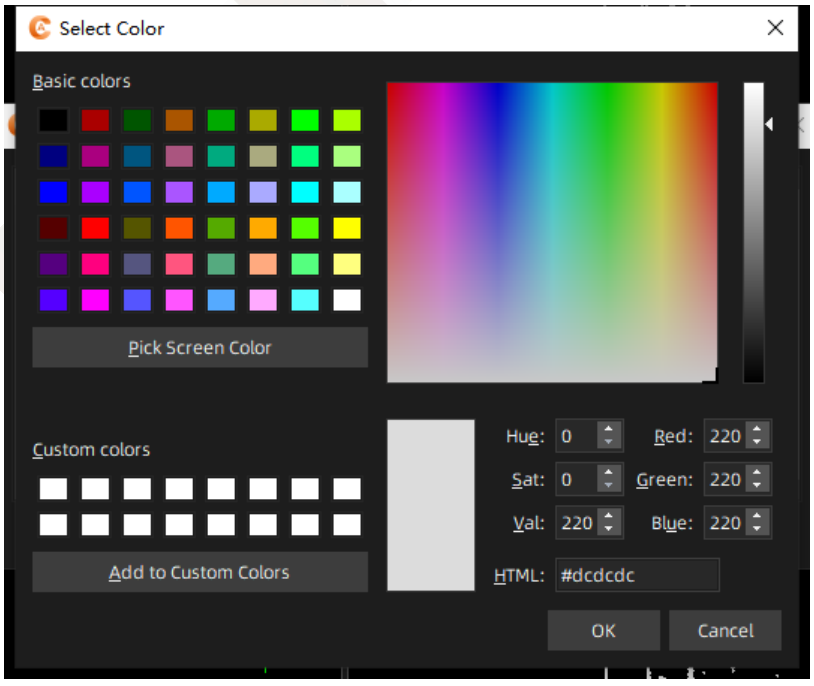


Figure: Set Classification Color

Note: This function is only effective for point cloud data containing classification info rmation.

2.1.2.5.5 RGB Rendering

Function Description:

Display point clouds using the color attributes (RGB values) of the point cloud data.

Operation Steps:

① Click Facade View Toolbar -> Point Cloud Rendering -> RGB;

② The point cloud data in the view is rendered and displayed according to its own RGB color value, as shown in the following figure:

Figure: True Color Rendering

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

2.1.2.5.6 Blend Rendering

Function Description:

This function realizes the mixed rendering display of point cloud data, mapping the el evation and intensity attributes of the point cloud data to uniformly varying color inte

rvals, which can show the combined change effect of elevation and intensity, facilitati ng clear distinction of ground object boundaries.

Operation Steps:

① Click Facade View Toolbar -> Point Cloud Rendering -> Blend to view the elevat ion and intensity blend rendering effect;

② After selecting the color strip, the point cloud after blend rendering will be displa yed in the view.

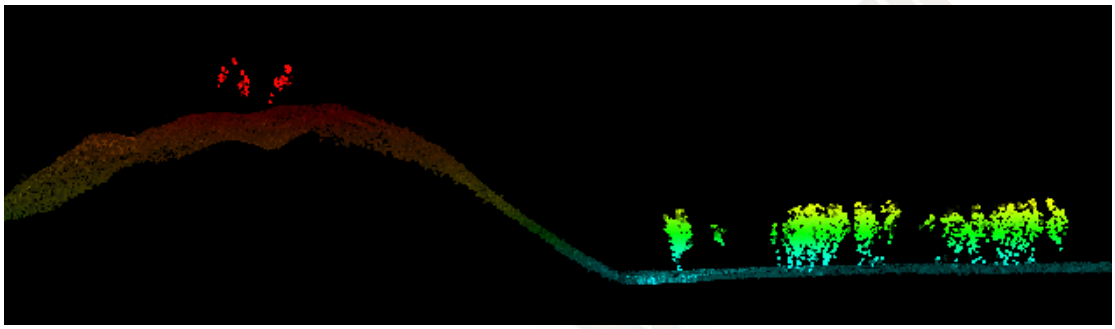


Figure: Blend Rendering

③ Click Rendering Settings. As shown in the figure below, drag the scroll bar, scroll the wheel, or enter numbers to modify the elevation and intensity to change the maximum and minimum values of the elevation and intensity, and view the blend rendering effect in real time. Click the reset button in the lower right corner to re store the default values.

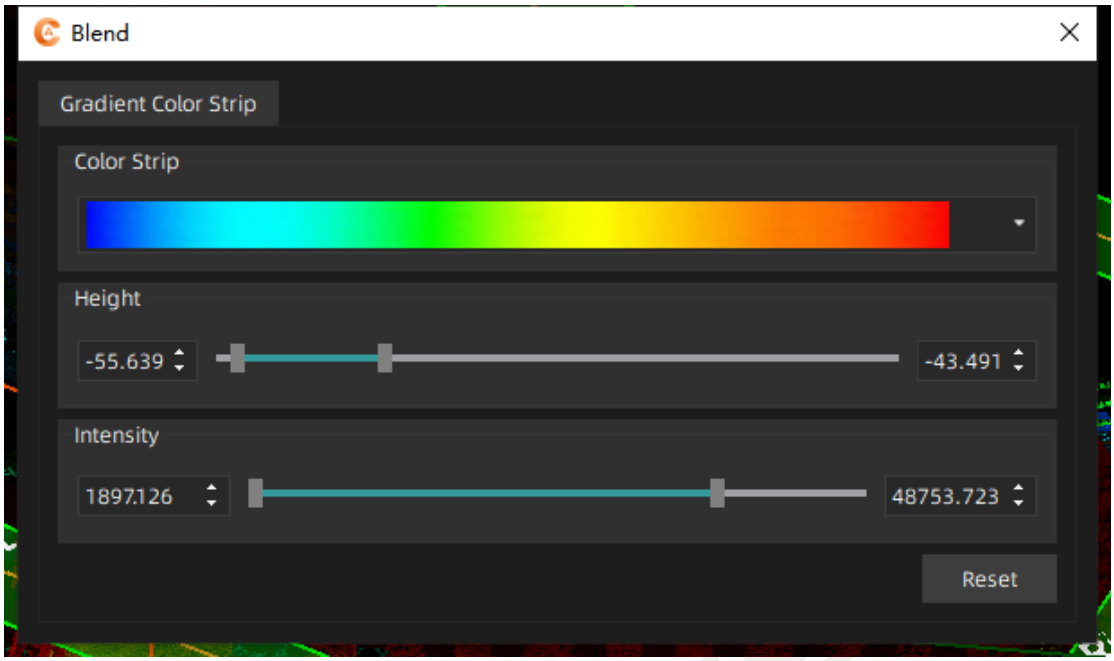


Figure: Blend Rendering Settings

2.1.2.5.7 Echo Number Rendering

Function Description:

Render point clouds with different color values according to their echo number attributes, facilitating intuitive differentiation of point cloud data with different echo numbers.

Operation Steps:

Click Facade View Toolbar -> Point Cloud Rendering -> Other -> Number of Returns to view the rendering results of data according to different echo numbers.

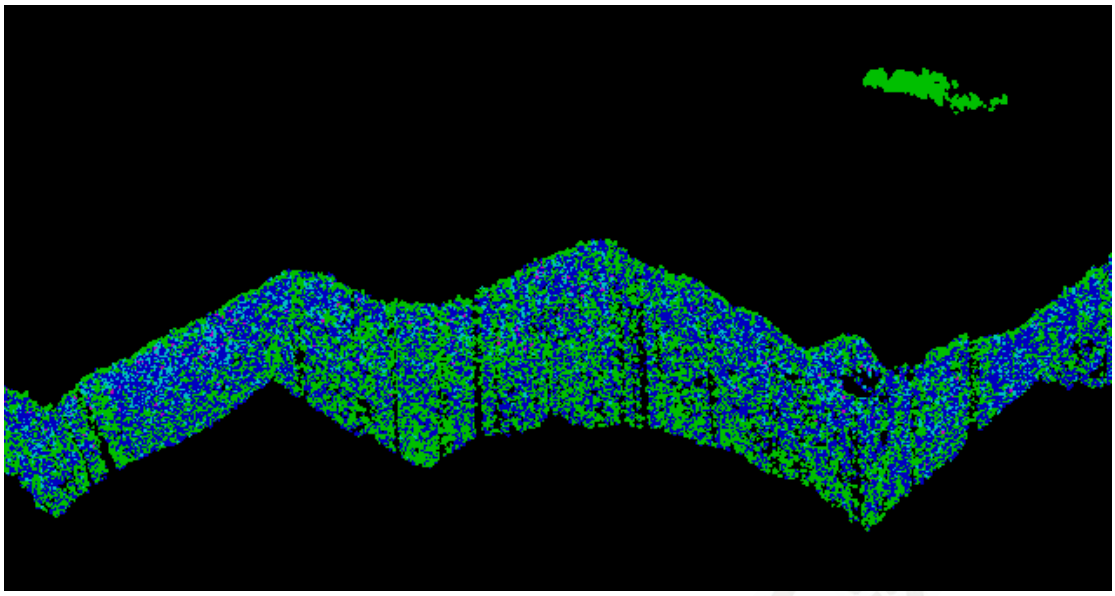


Figure: Number of Echo Rendering

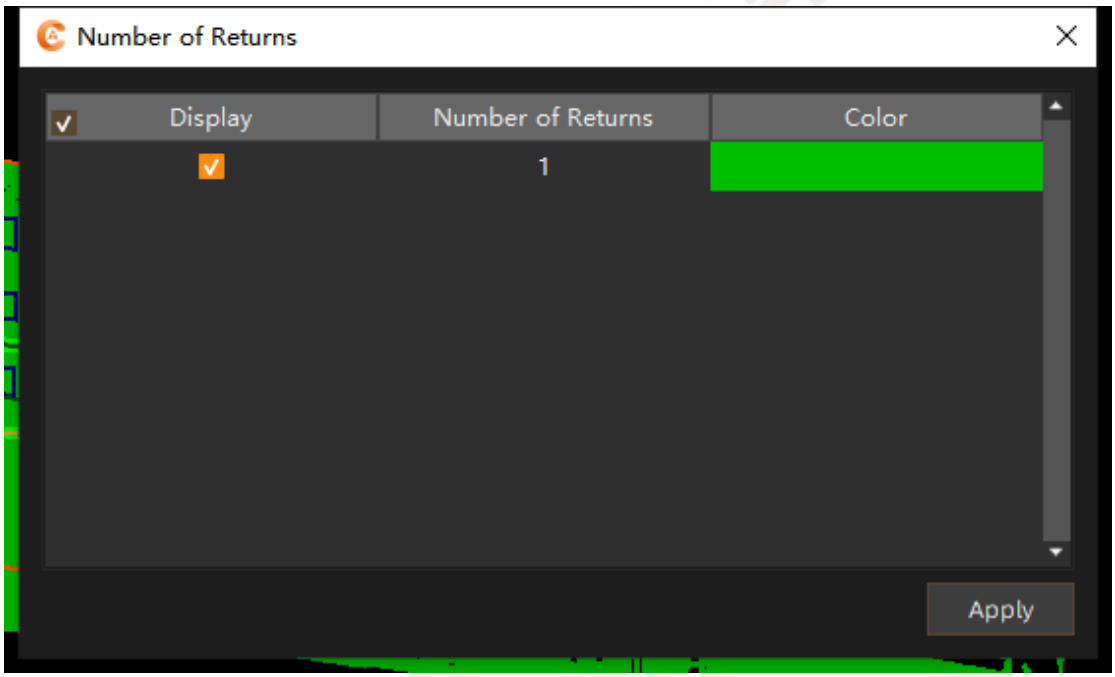


Figure: Echo Number Rendering Settings

2.1.2.5.8 Echo Sequence Number Rendering

Function Description:

Render point clouds with different color values according to their echo sequence numb

er attributes, quickly viewing the rendering effects of different echo sequences.

Operation Steps:

Click facade View Toolbar -> Point Cloud Rendering -> Other ->Return Number to view the echo sequence number rendering of the point cloud.

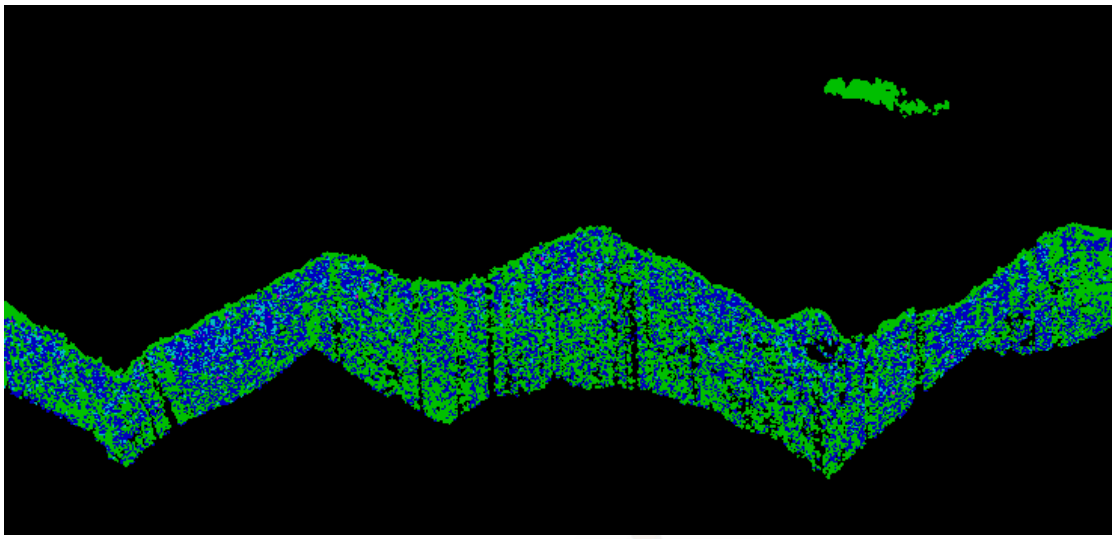


Figure: Echo Sequence Number Rendering

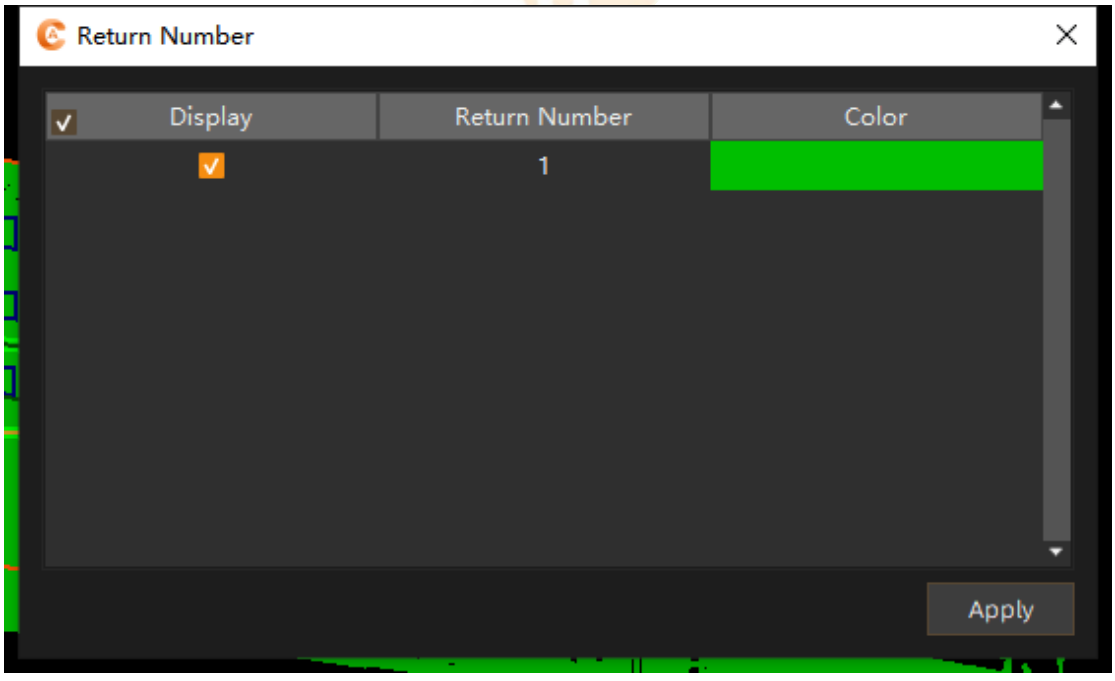


Figure: Echo Sequence Number Rendering Settings

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 t ime rendering effect.

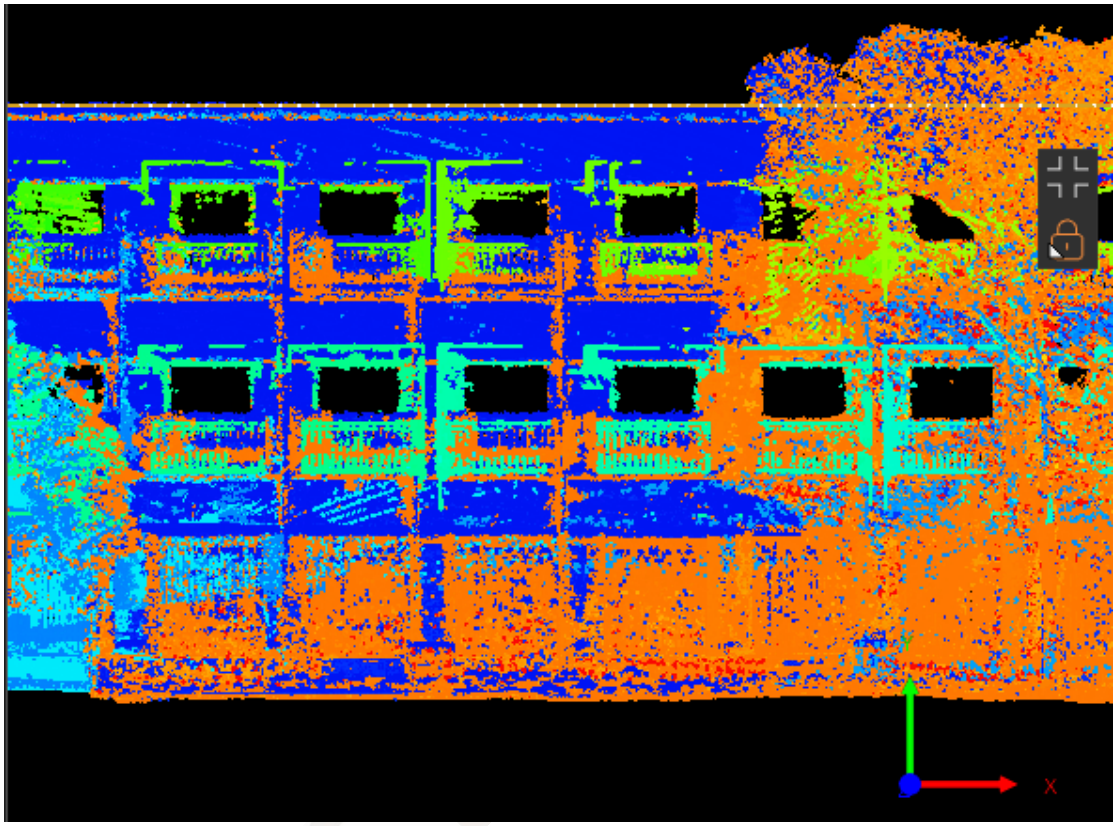


Figure: Time Rendering

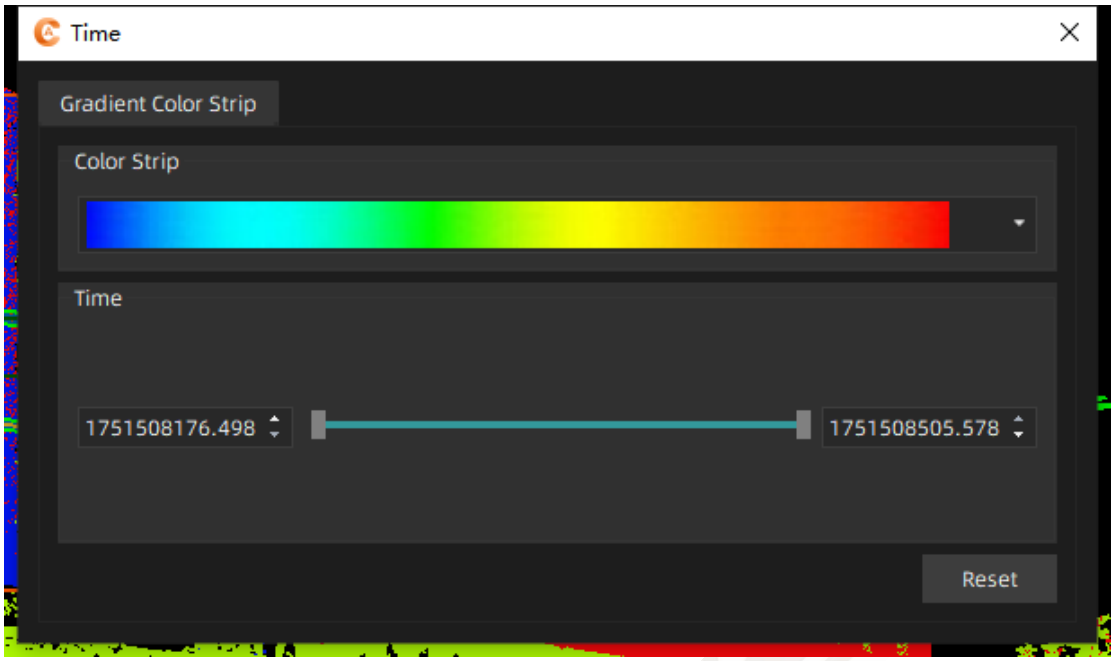


Figure: Time Rendering

2.1.2.5.10 Single Rendering

Function Description:

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

Operation Steps:

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

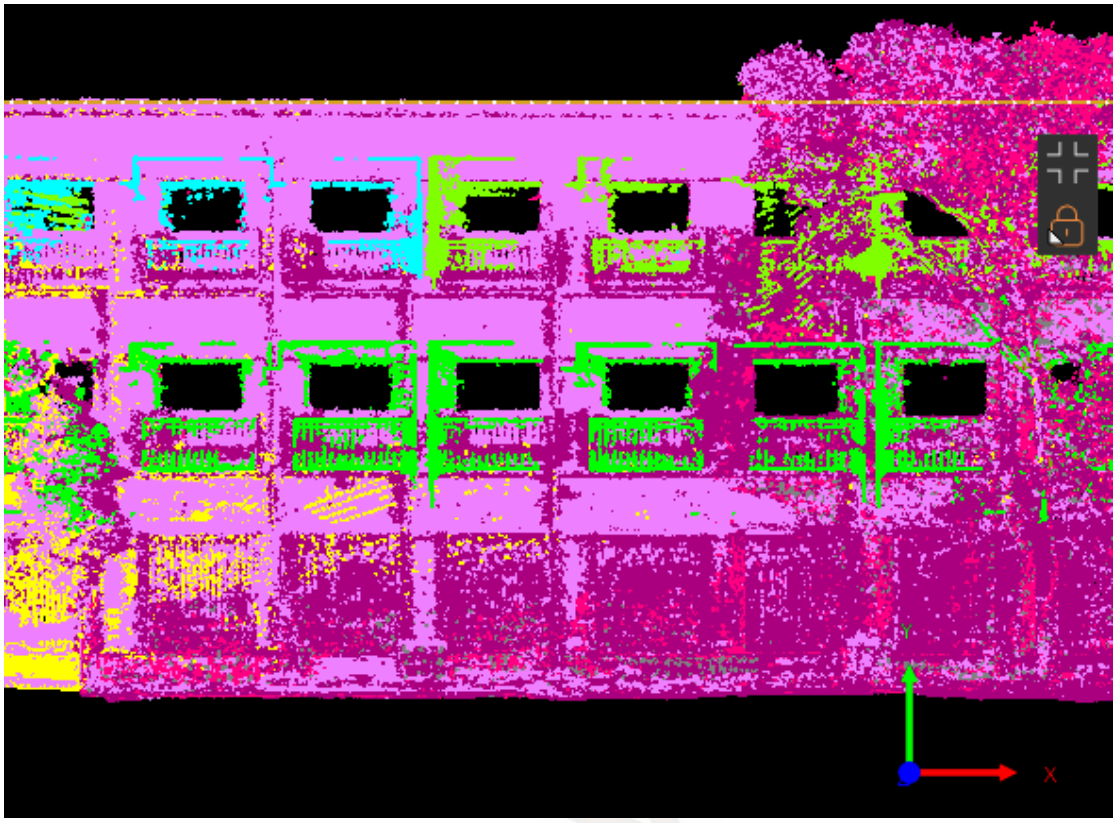


Figure: Single Color Rendering

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 Facade View Toolbar -> Point Cloud Rendering -> Other -> Scan Angle to view the scan angle rendering effect;

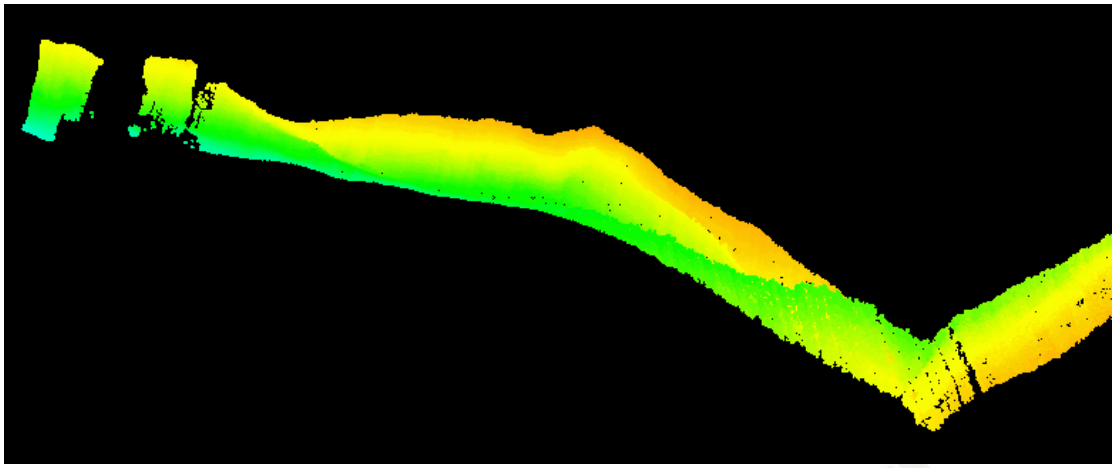


Figure: Scan Angle Rendering

② Select different color strips in the color strip as needed; click Rendering Settings, drag the scroll bar or scroll the wheel to modify the maximum and minimum values of the scan angle range, and you can view the scan angle rendering effect in real time. Reset is used to restore the default values.

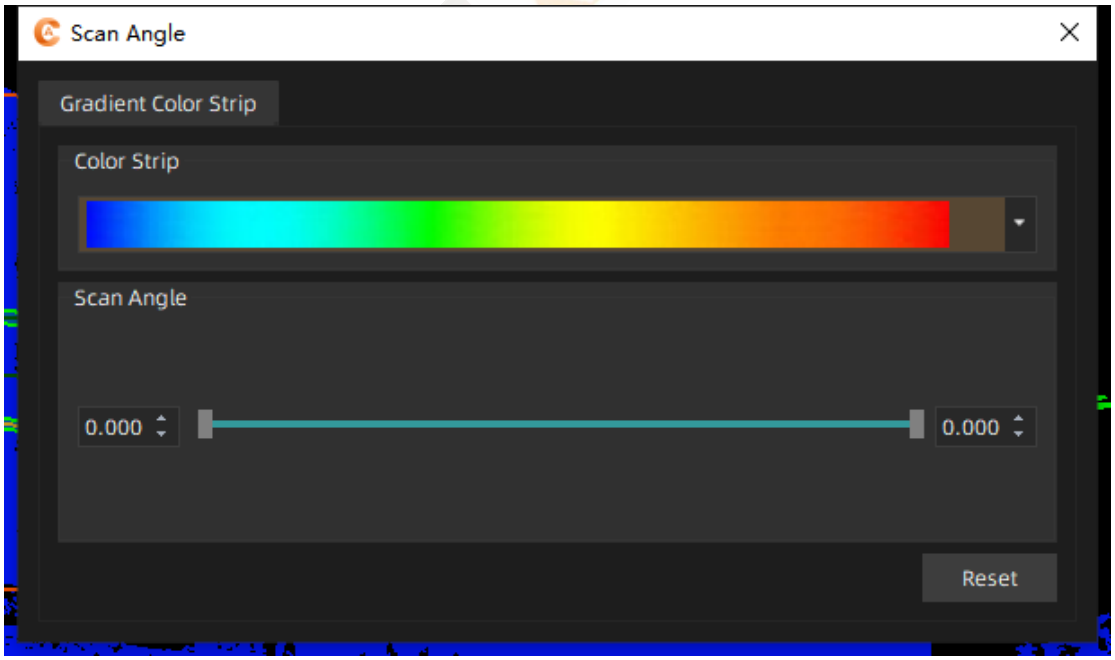


Figure: Scan Angle Rendering Settings

2.1.2.5.12 Scan Direction Rendering

Function Description:

Map the scan direction values to uniformly varying color values based on different sc an directions of the point cloud data.

Operation Steps:

① Click Facade View Toolbar -> Point Cloud Rendering -> Other -> Scan Direction to view the scan direction rendering effect;

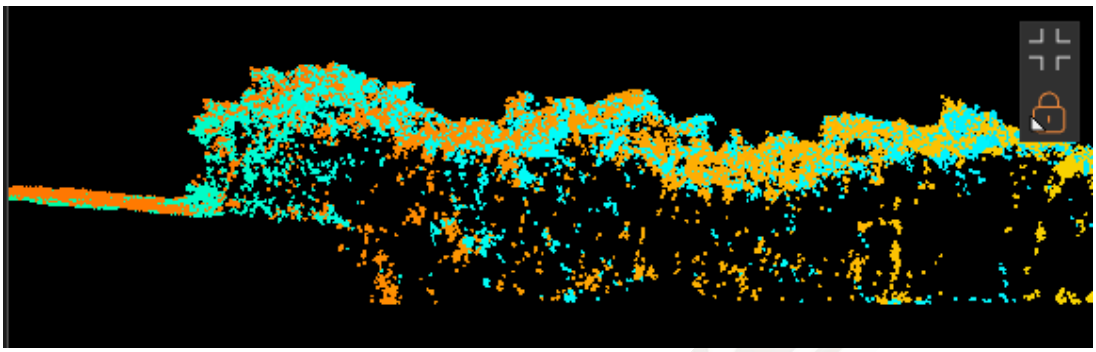


Figure: Scan Direction Rendering

② Select different color strips in the color strip as needed; click Rendering Settings, drag the scroll bar or scroll the wheel to modify the maximum and minimum val ues of the scan direction range, and you can view the scan direction rendering eff ect in real time. Reset is used to restore the default values.

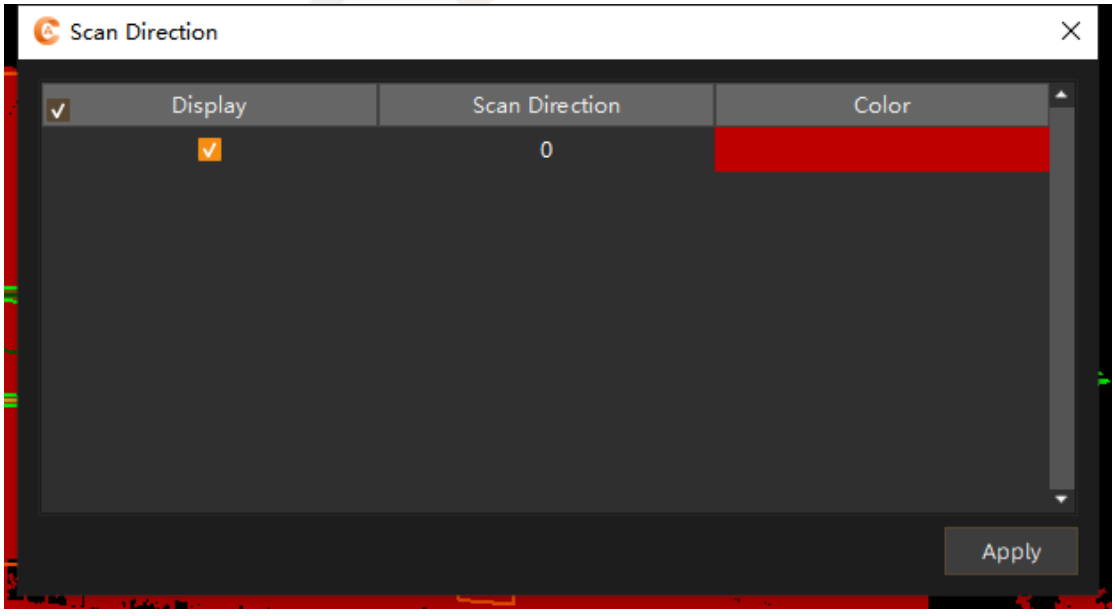


Figure: Scan Direction Rendering Settings

2.1.2.5.13 Source ID Rendering

Function Description:

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

Operation Steps:

① Click Facade View Toolbar -> Point Cloud Rendering -> Other -> Source ID to view the source ID rendering effect;

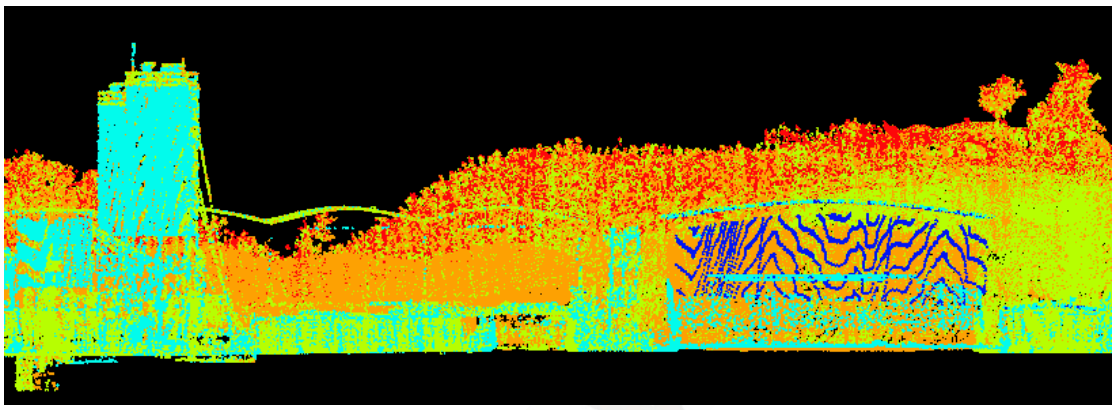


Figure: Source ID Rendering

② Select different color strips in the color strip as needed; click Rendering Settings, drag the scroll bar, scroll the wheel, or enter numbers to modify the maximum and minimum values of the source ID range, and you can view the source ID rendering effect in real time. Click the reset button in the lower right corner to restore the default values.

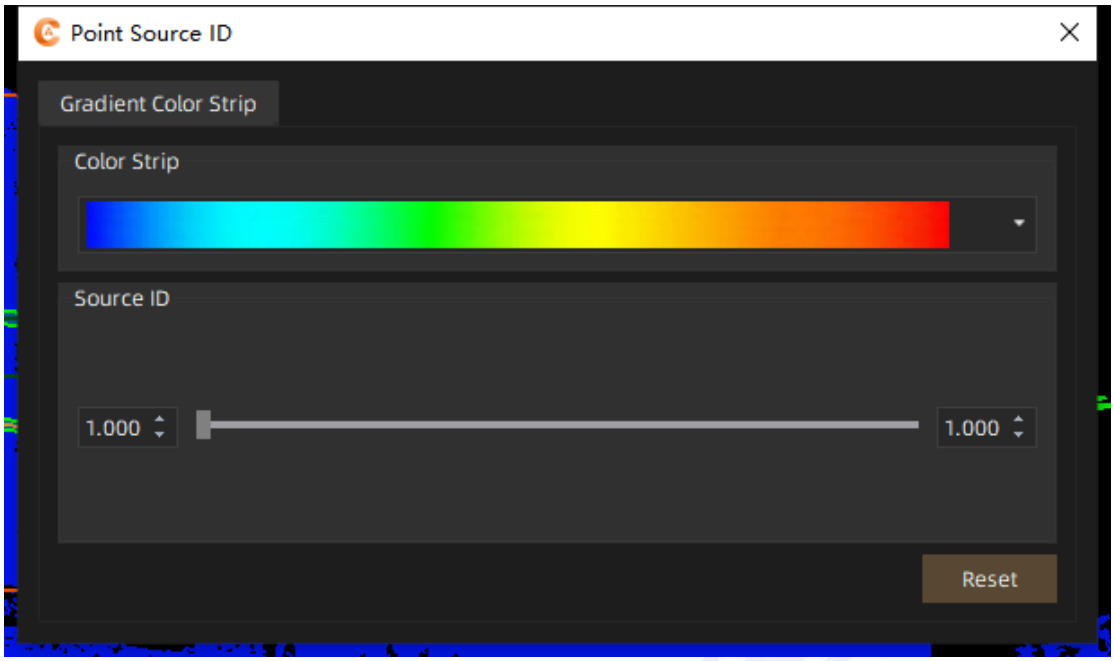


Figure: Source ID Rendering Settings

2.1.2.6 Point Size

Function Description:

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

Operation Steps:

Click Facade View Toolbar -> Set Point Size, scroll the mouse wheel, scroll up to increase the point size, scroll down to decrease the point size, or directly enter the point size value to change the point size. The point size adjustment effect is displayed in the view window in real time.

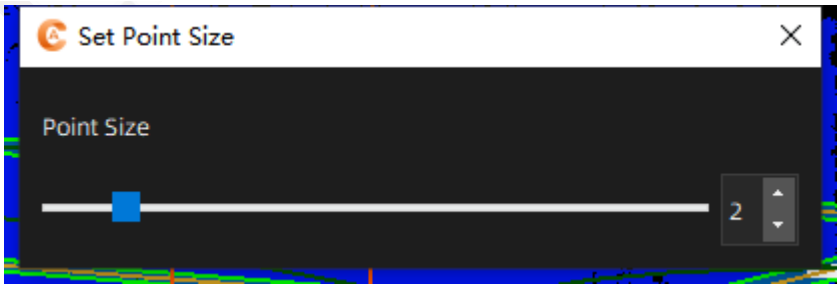


Figure: Point Size Settings

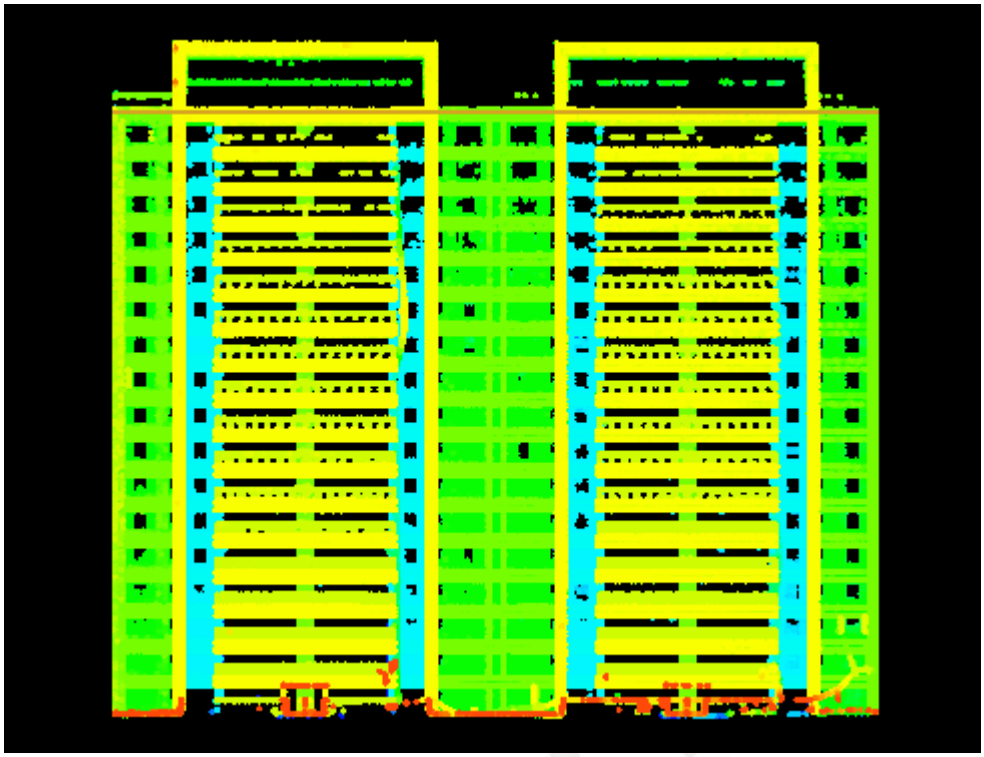


Figure: Point Size is 3

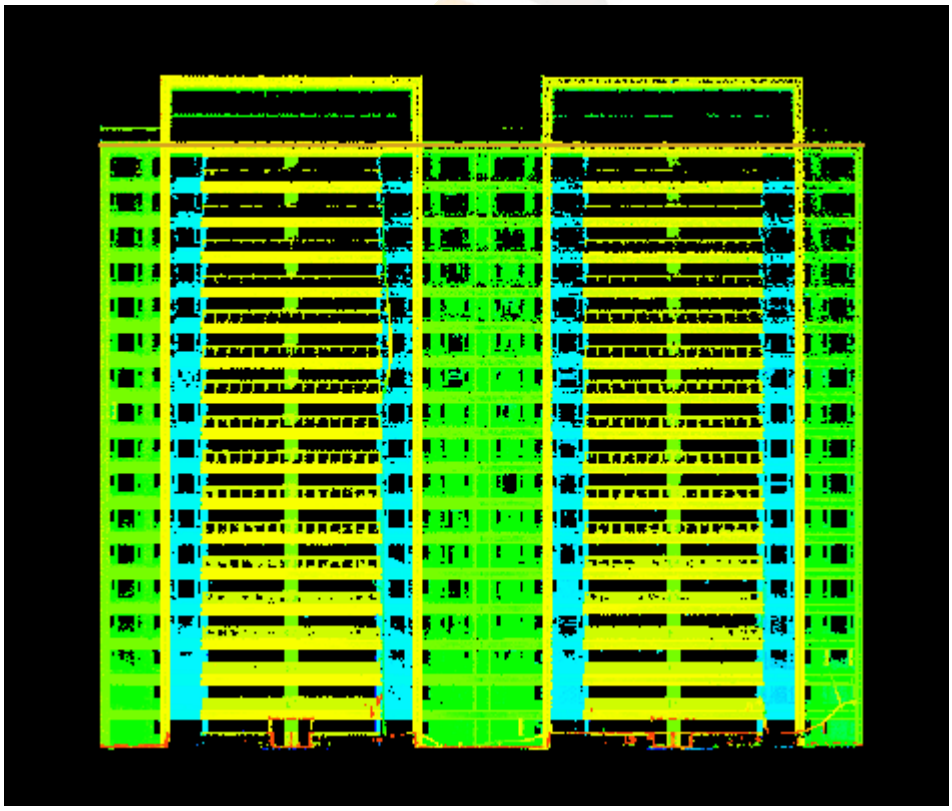


Figure: Point Size is 1

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:

Adjust the opacity of the point cloud data in the view.

Operation Steps:

Click Facade View Toolbar -> Opacity Setting, scroll the mouse wheel, scroll up to increase the point cloud opacity, scroll down to decrease the point cloud opacity, or directly enter the opacity value to change the point cloud opacity. The adjustment effect is displayed in the view window in real time.

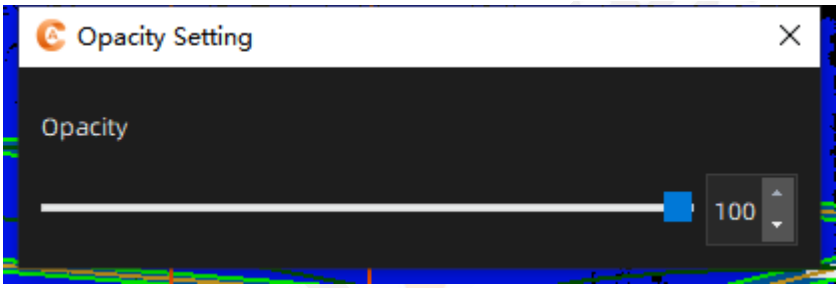


Figure: Opacity Settings

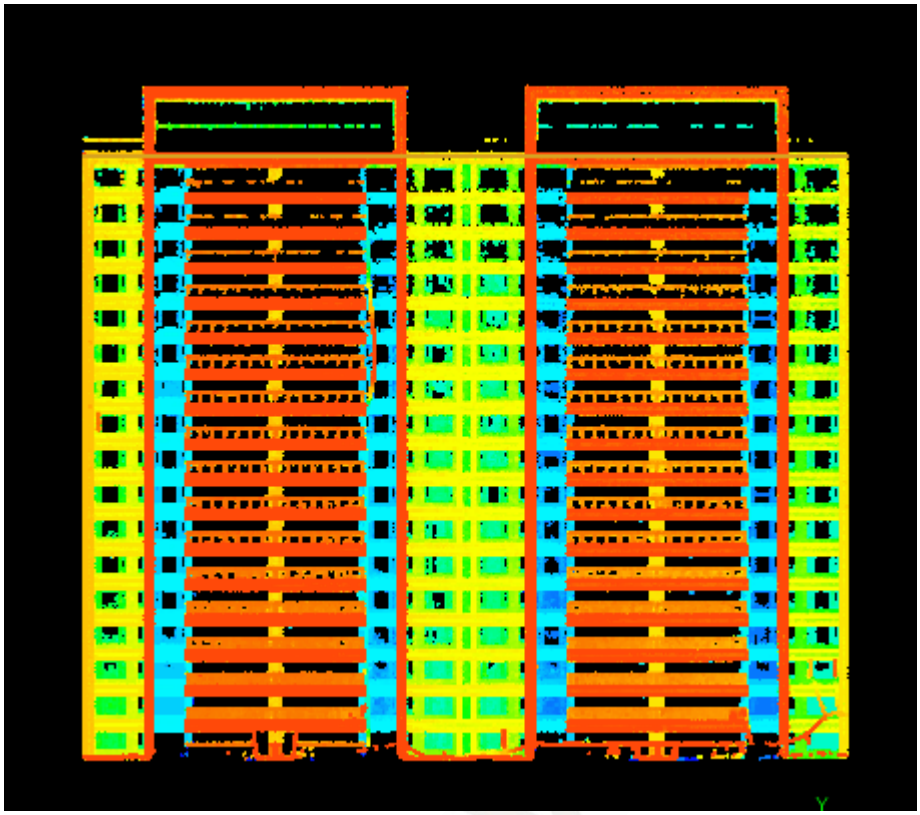


Figure: Opacity 100%

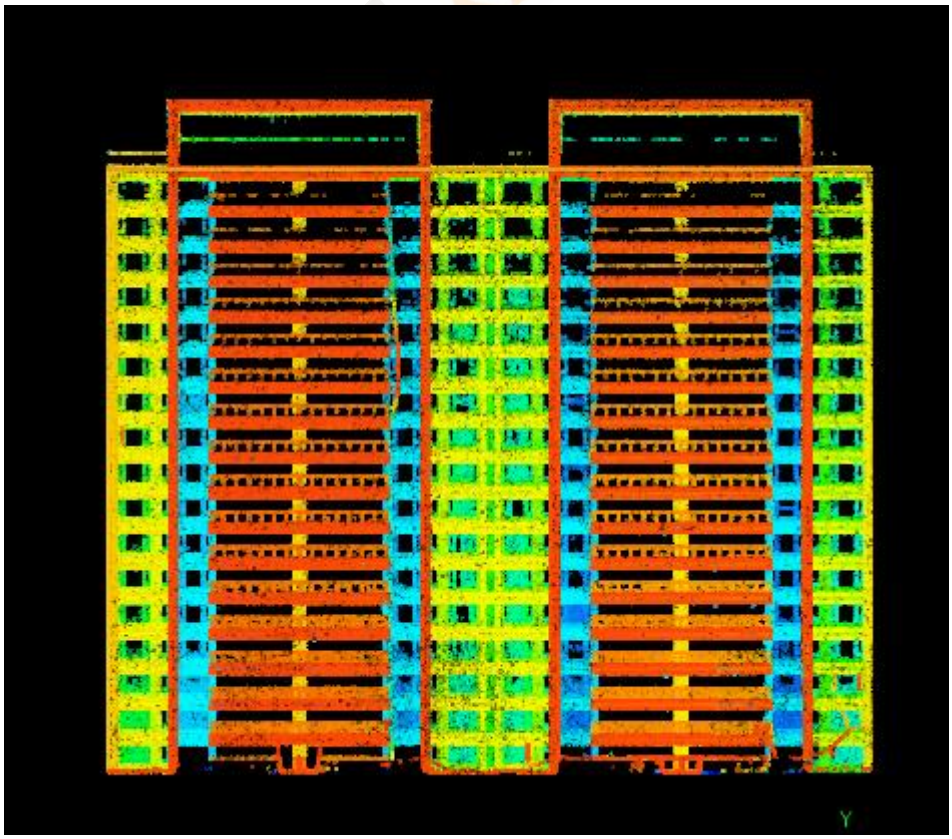


Figure: Opacity 50%

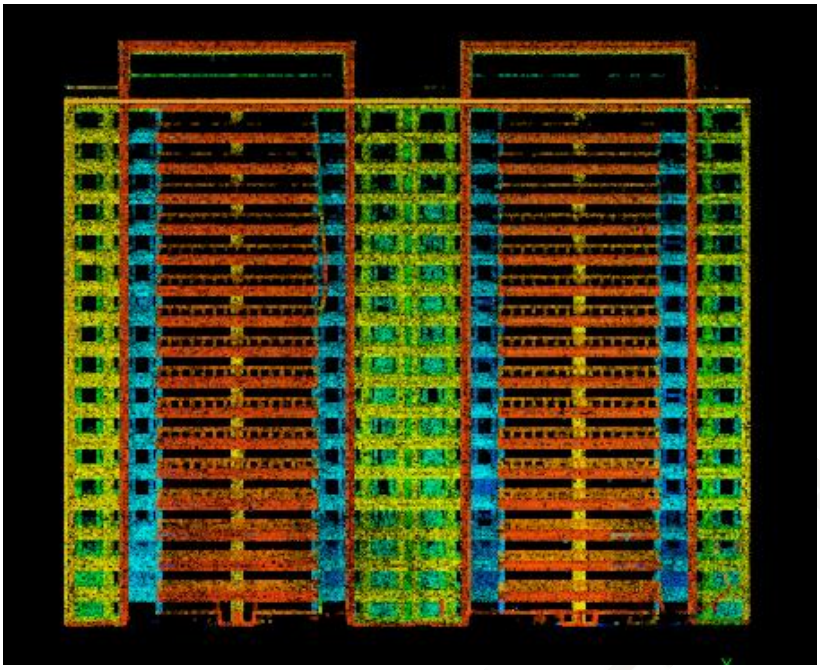


Figure: Opacity 20%

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.

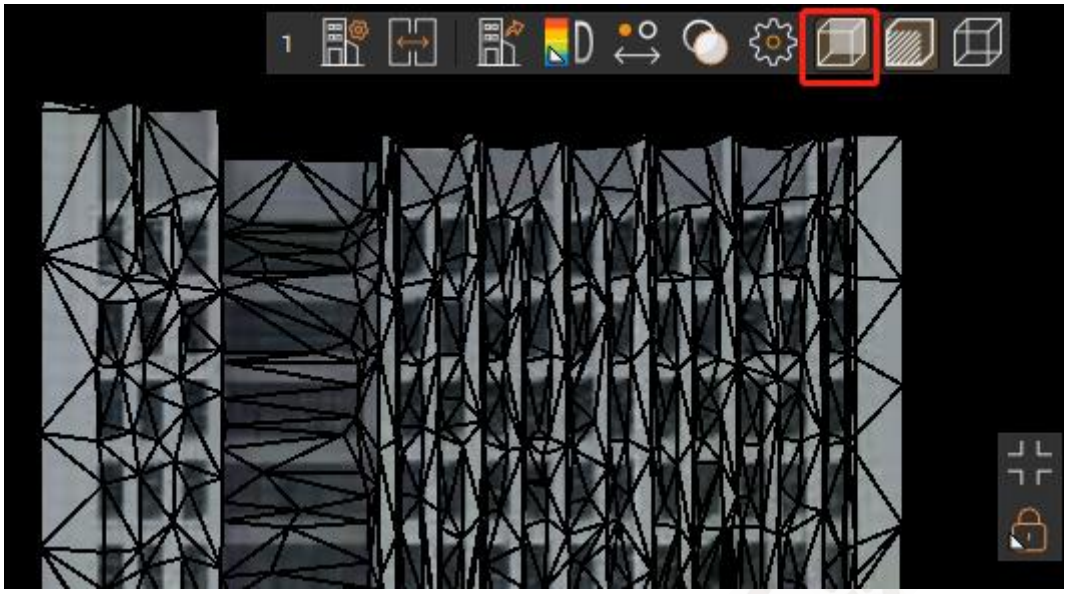


Figure: Facade View Wireframe Rendering

2.1.2.9 Texture Rendering

Function Description:

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

Operation Steps:

Click Elevation View Toolbar -> Texture to switch the display and closing of the wireframe, which is open by default.

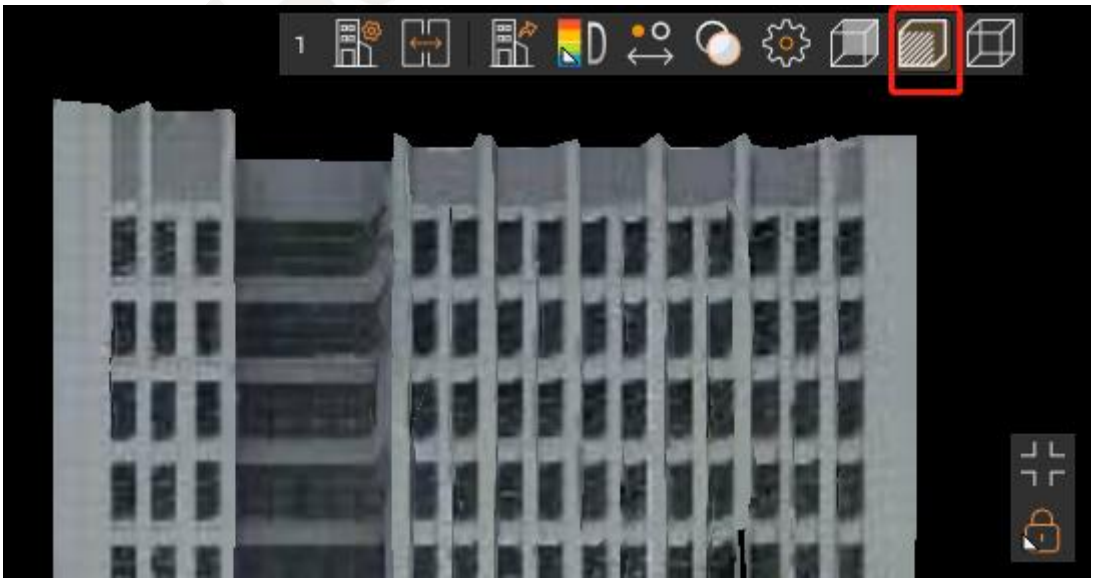


Figure: Enable Texture Rendering

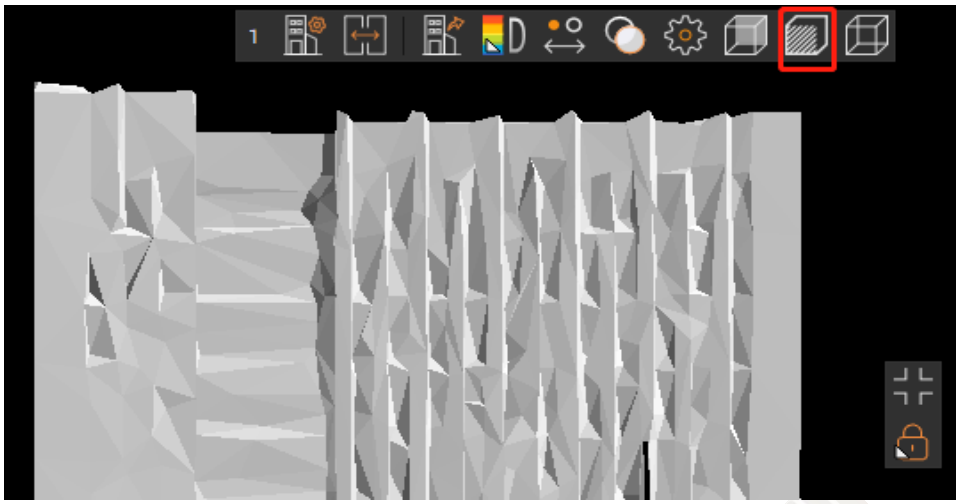


Figure: Disable Texture Rendering

2.1.2.10 Wireframe-Only Rendering

Function Description:

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

Operation Steps:

Click Facade View Toolbar -> Wireframe Only to switch the display and closing of t he wireframe-only mode, which is closed by default. When the wireframe-only mode i s enabled, the model only displays the wireframe part.

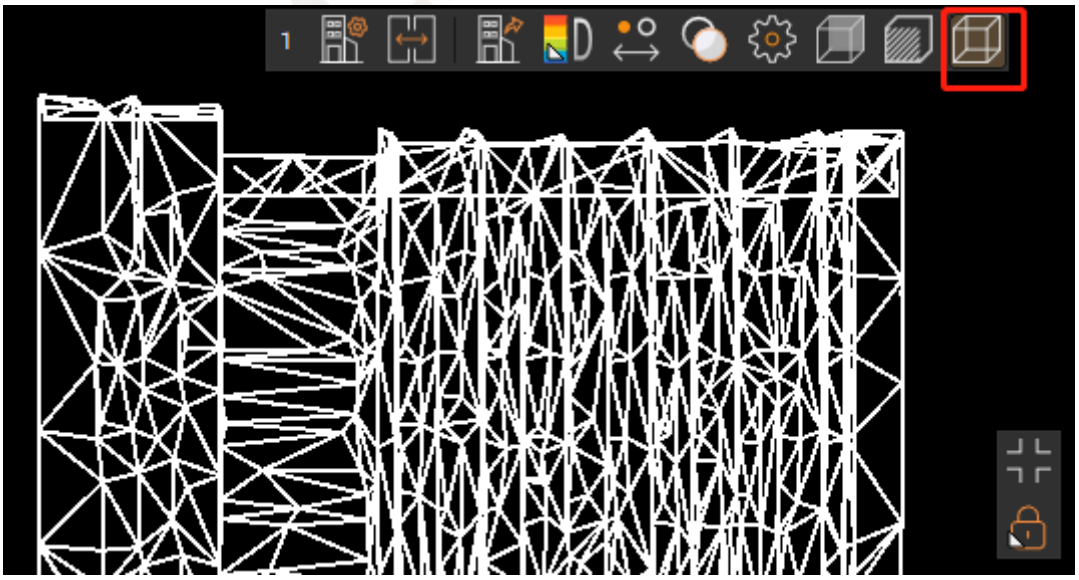


Figure: Facade View Wireframe Rendering

Note: After enabling wireframe-only rendering, the wireframe and texture rendering bu

ttons are grayed out. You can set wireframe and texture rendering only after exiting t he wireframe-only rendering mode.

2.1.2.11 Center Display

Function Description:

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

Operation Steps:

Click Facade View Toolbar -> Center to center the facade data in the view.

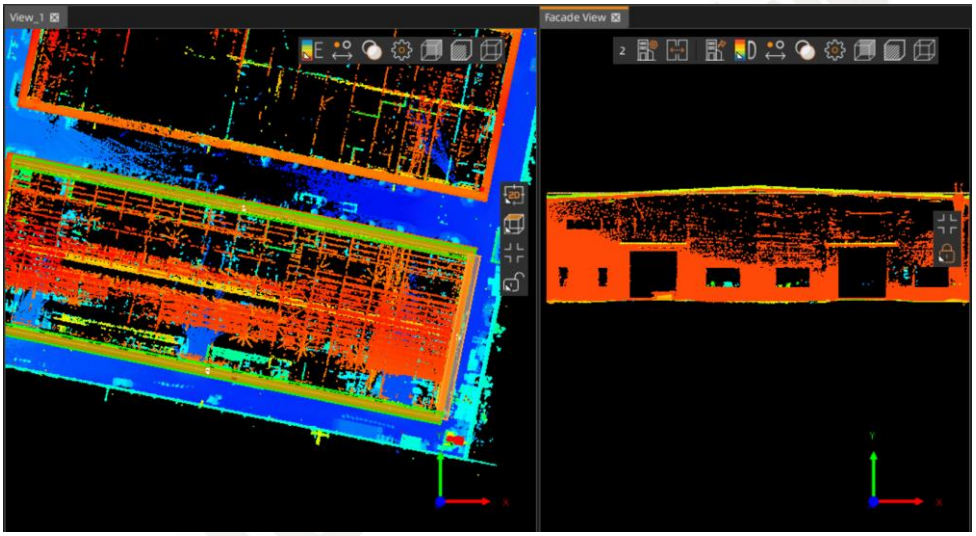


Figure: Facade View Centering Effect

2.1.2.12 View Lock

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

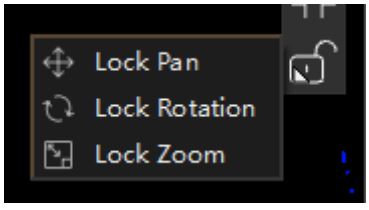


Figure: Lock View

2.1.2.12.1 Lock Pan

In the facade view, press and hold the right mouse button to drag and pan the objects in the view.

Activate the lock pan function, and the data objects in the view cannot be panned.

2.1.2.12.2 Lock Rotate

Objects in the facade view do not support rotation operations, rotation is locked by default, and unlocking is not supported.

2.1.2.12.3 Lock Zoom

In the facade view, scrolling the mouse wheel upward enlarges the display of objects in the view, and scrolling the mouse wheel downward reduces the display of objects in the view.

Activate the lock zoom function, and the data objects in the view cannot be zoomed.

2.1.2.13 Real-Time 3D Coordinate Axis

Display the direction of the current facade view, with the Y-axis as the vertical upward direction; the X-axis as the horizontal direction, parallel to the proxy line of the current facade; the Z-axis points to the user, indicating the positive direction of depth, and the depth at the center line of the proxy line is 0.

Operation Steps:

After creating the facade view, the real-time coordinate axis of the facade view are displayed in the lower right corner.

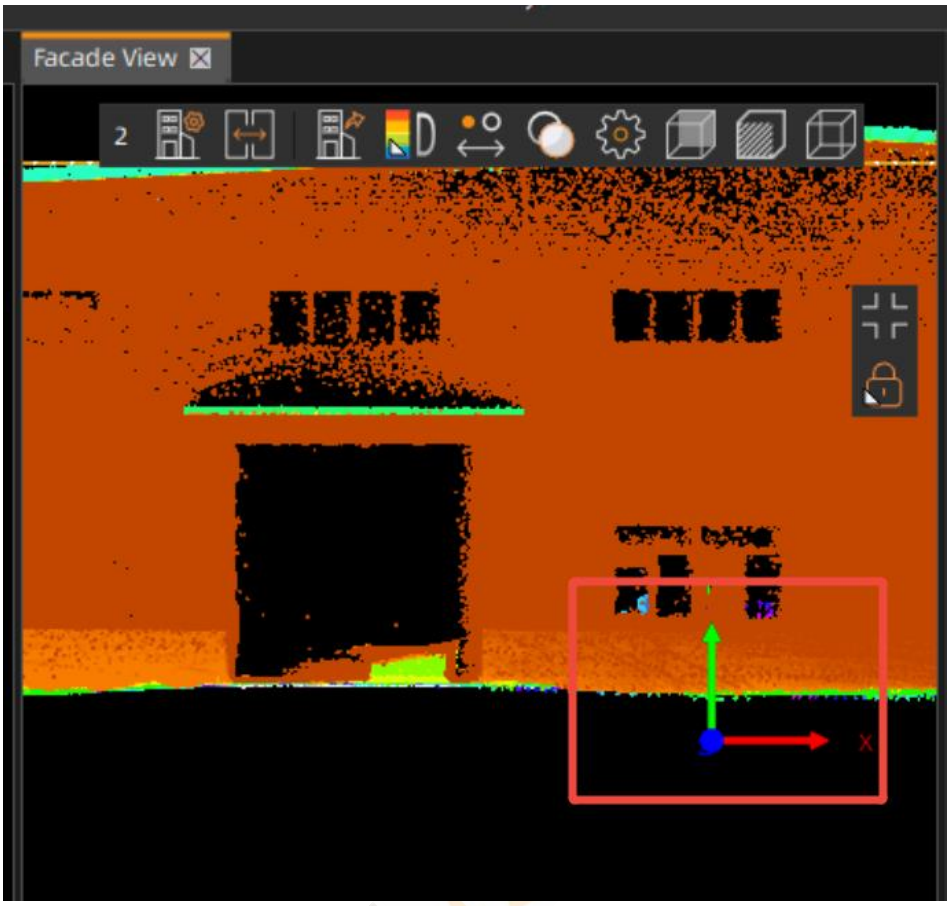


Figure: Facade Real-Time Coordinate Axis

2.1.3 Snap

The snap types supported by the software include: model snap, point cloudsnap, polar snap, endpoint snap, node snap, nearest point snap, intersection snap, midpoint snap, a nd circle center snap, geometry center snap.

Figure: Snap Status Bar

2.1.3.1 Model Snap

Function Description:

When model snap is enabled, during vector drawing/editing/measurement, you can sna p to the model near the mouse position.

Operation Steps:

Click the model snap button in the status bar at the bottom right of the software. When the button is highlighted, it is in the enabled state. The software enables model snap by default. When you do not need to snap to the model, click the button to cancel the highlight to disable model snap.

Figure: Model Snap Button

Figure: Model Snap Style

2.1.3.2 Point Cloud Snap

Function Description:

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

Operation Steps:

Click the point cloud snap button in the status bar at the bottom right of the software. When the button is highlighted, it is in the enabled state. The software enables point cloud snap by default. When you do not need to snap to the point cloud, click the button to cancel the highlight to disable point cloud snap.

Figure: Point Cloud Snap Button

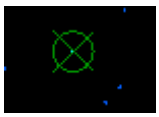


Figure: Point Cloud Snap Style

2.1.3.3 Polar Snap

Function Description:

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

Operation Steps:

Click the polar snap button in the status bar at the bottom right of the software. When the button is highlighted, it is in the enabled state. When you do not need polar snap, click the button to cancel the highlight to disable polar snap.

Figure: Polar Snap Button

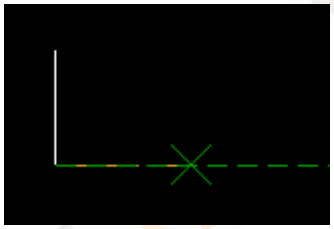


Figure: Polar Snap Style

2.1.3.4 Endpoint Snap

Function Description:

When endpoint snap is enabled, during vector drawing/editing/measurement, you can snap to the endpoints or corner points of vector lines.

Operation Steps:

Click the endpoint snap button in the status bar at the bottom right of the software. When the button is highlighted, it is in the enabled state. The software enables endpoint snap by default. When you do not need to snap to vector endpoints, click the button to cancel the highlight to disable endpoint snap.

Figure: Endpoint Snap Button

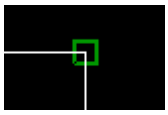


Figure: Endpoint Snap Style

2.1.3.5 Node Snap

Function Description:

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

Operation Steps:

Click the node snap button in the status bar at the bottom right of the software. When the button is highlighted, it is in the enabled state. The software enables node snap by default. When you do not need to snap to nodes, click the button to cancel the highlight to disable node snap.

Figure: Node Snap Button

Figure: Node Snap Style

2.1.3.6 Nearest Point Snap

Function Description:

When nearest point snap is enabled, during vector drawing/editing/measurement, you can snap to the vector line near the mouse position.

Operation Steps:

Click the nearest point snap button in the status bar at the bottom right of the software. When the button is highlighted, it is in the enabled state. The software enables ne

arest point snap by default. When you do not need to snap to the nearest point, click the button to cancel the highlight to disable nearest point snap.

Figure: Intersection Snap Button

Figure: Intersection Snap Style

2.1.3.7 Intersection Snap

Function Description:

When intersection snapping is enabled, you can snap to the intersections of vector lines during vector drawing, editing, or measurement.

Operation Steps:

To enable intersection snapping, click the intersection snapping button in the bottom-right corner of the software's status bar. The button will highlight when activated. To disable it, simply click the button again to remove the highlight.

Figure: Intersection Snap Button

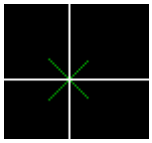


Figure: Intersection Snap Style

2.1.3.8 Midpoint Snap

Function Description:

When midpoint snap is enabled, during vector drawing/editing/measurement, it can snap to the midpoint of a vector line.

Operation Steps:

Click the midpoint snap button in the status bar at the bottom right of the software. The button is in the enabled state when highlighted. To disable vector midpoint snapping, click the button to cancel the highlight.

Figure: Midpoint Snap Button

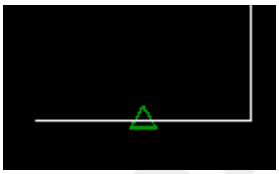


Figure: Midpoint Snap Style

2.1.3.9 Circle Center Snap

Function Description:

When center snap is enabled, during vector drawing/editing/measurement, it can snap to the center of a circle or arc.

Operation Steps:

Click the center snap button in the status bar at the bottom right of the software. The button is in the enabled state when highlighted. To disable center snapping, click the button to cancel the highlight.

Figure: Center Snap Button

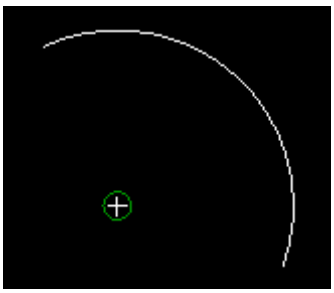


Figure: Center Snap Style

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 software enables snap by default). To disable all snap types, click the button to cancel the highlight.

Figure: Snap Switch Button

2.1.1.11 Snap Settings

Function Description:

In the snap settings dialog box, users can choose whether to enable the snap function and select snap types.

Operation Steps:

① Click the drop-down arrow button in the status bar at the bottom right of the software to pop up the snap panel. In the snap panel, you can also enable or disable a specific snap type.

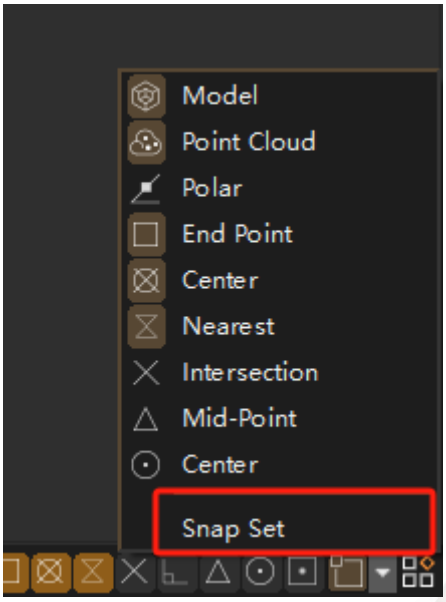


Figure: Snap Settings Button

② Click the "Snap Settings" button in the panel to pop up the snap settings dialog box. In the dialog box, users can choose whether to enable the snap function and select snap types: checking "Enable Object Snap" enables the snap mode, while unchecking it disables the snap mode; the checked state of a snap type indicates that the type is enabled, and unchecked indicates it is disabled.

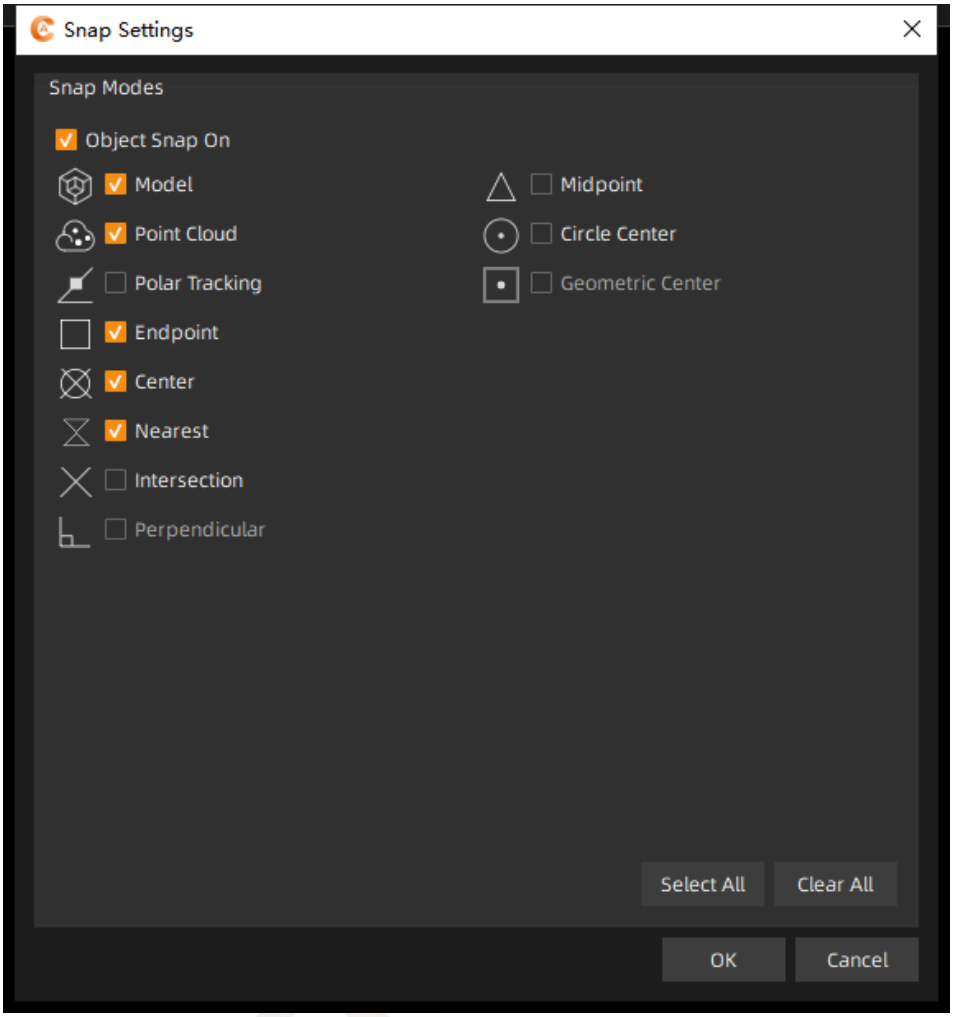


Figure: Snap Settings Dialog Box

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

④ Click the "OK" button to make the settings take effect; click the "Cancel" button to discard the settings.

2.2 File Module

The File module includes creating a new project, opening a project, saving a project, and settings.

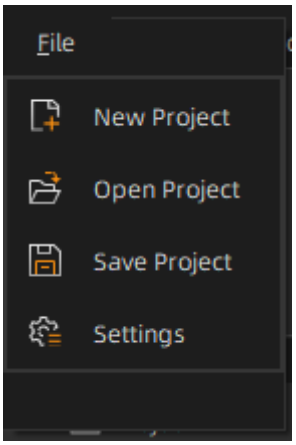


Figure: File Menu

2.2.1 New Project

Function Description:

Create a new project to manage point cloud, vector, DEM, image, or model data.

Operation Steps:

① Click File -> New Project. A default project named "工程.hcprj" (Project.hcprj) is created.

2.2.2 Open Project

Function Description:

Open a saved project, which will automatically load point cloud, vector, DEM, image, or model data under the project.

Operation Steps:

① Click File -> Open Project, select the .hcprj file, and click Open.

2.2.3 Save Project

Function Description:

Save the project for loading of point cloud, vector, DEM, image, or OSGB model dat a by reopening the project later.

Operation Steps:

① After importing point cloud, vector, DEM, image, or OSGB model data, click File -> Save Project, select the save path, enter a file name, and click Save.

2.2.4 Settings

2.2.4.1 Shortcut Keys

Function Description:

Provide keyboard command combinations for high-frequency operations to quickly execute commands, switch interfaces, or trigger tools, reducing reliance on the mouse and improving operation efficiency. Support user-defined key positions, ensuring consistent operation logic and visualized shortcut prompts.

Operation Steps:

① Click File -> Settings -> Shortcut Keys to open the shortcut key settings interface.

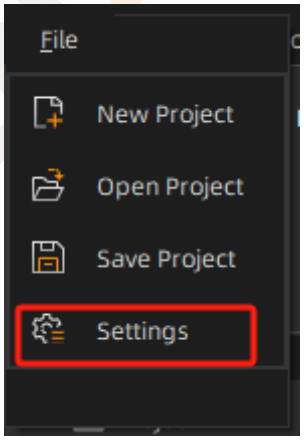


Figure: Settings Location

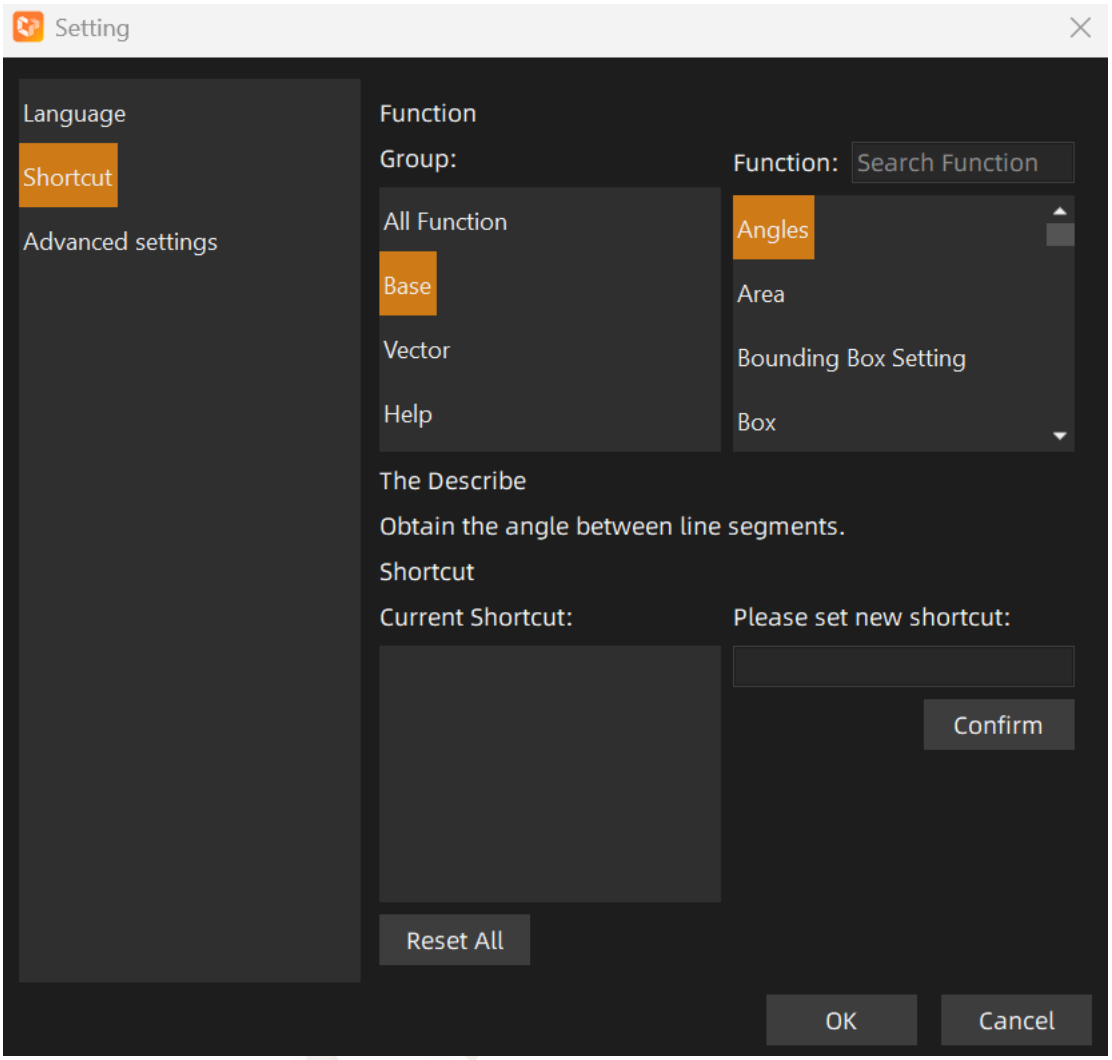


Figure: Shortcut Keys

② In the function list, select the function for which you want to add or modify a s hortcut key.

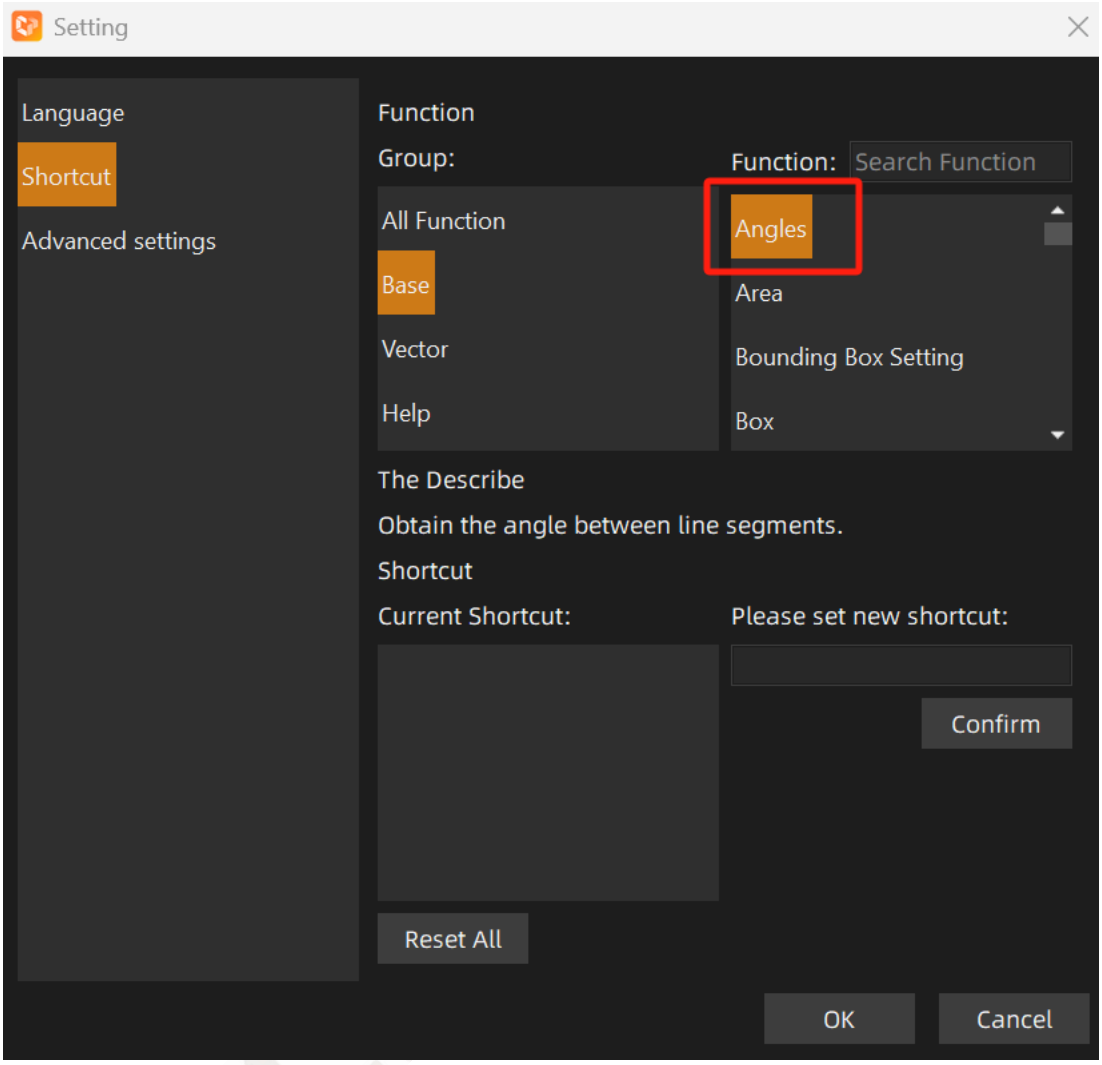


Figure: Select Function

③ Select the shortcut key input box, enter the shortcut key, click the "Confirm" butt on below the input box. The entered shortcut key will be bound to the currently selected function. Click "OK" in the bottom right corner of the interface to make the binding effective.

④ After selecting a function, all shortcut keys corresponding to the selected function will appear in the current shortcut key list. Click the red “Delete” button on the right of a shortcut key to unbind it from the selected function. Click "Ok" in th e bottom right corner to make the unbinding effective.

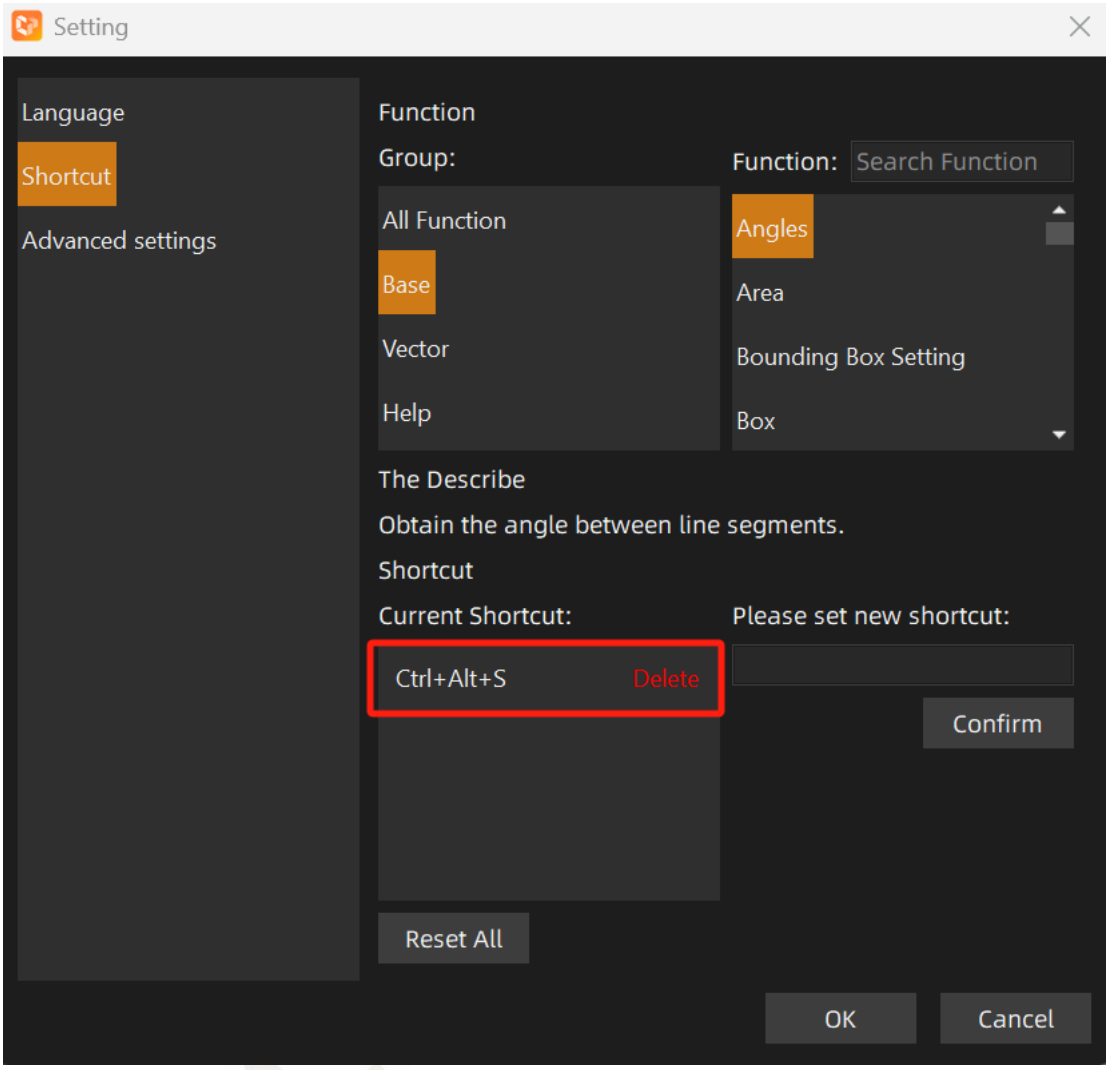


Figure: Delete Shortcut Key

⑤ Click the "Reset All" button in the bottom left corner of the shortcut key interface to reset all shortcut keys in the software. Click the "OK" button in the bottom right corner to make the reset effective.

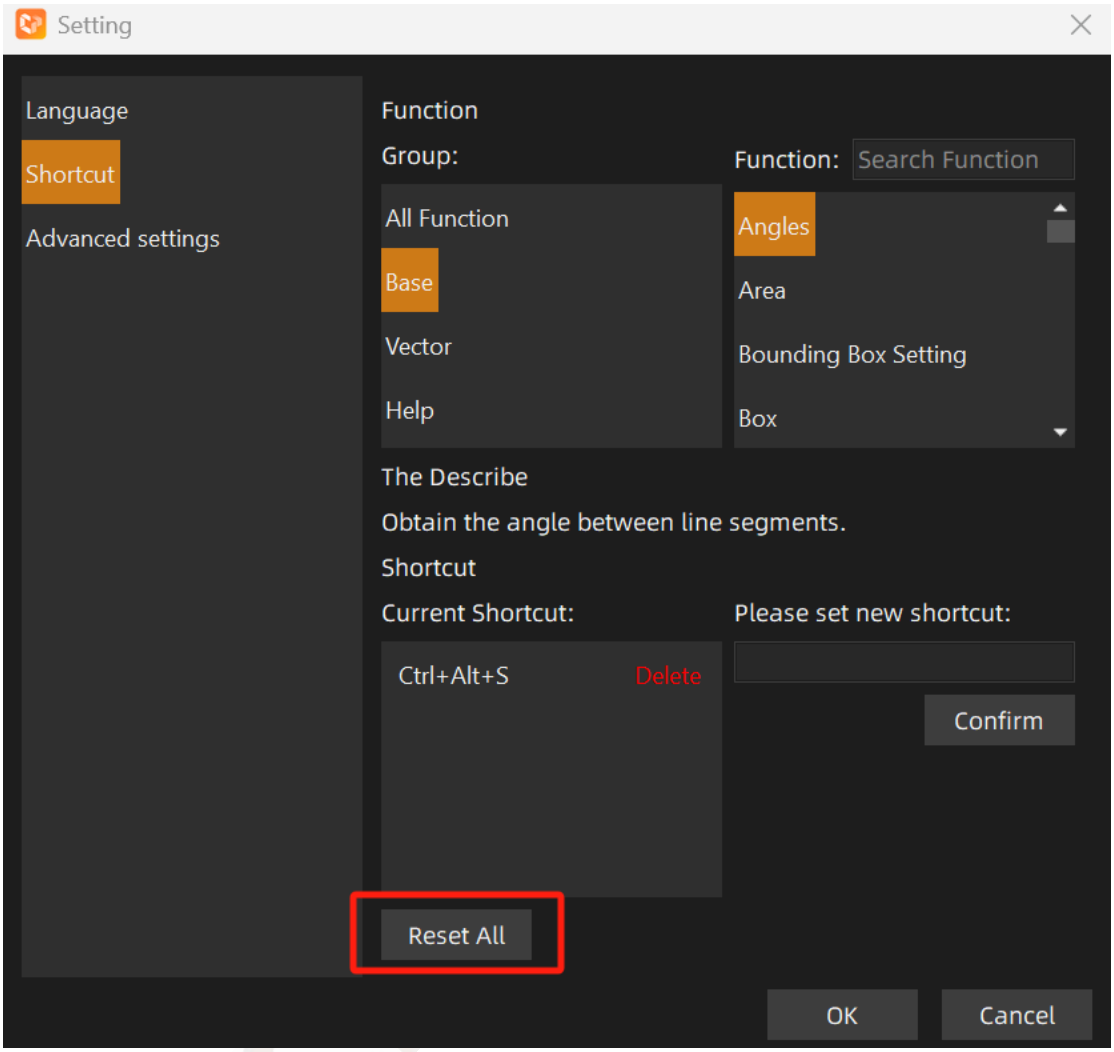


Figure: Reset All

⑥ The software occupies some default shortcut keys, which cannot be bound to specific functions. The default occupied shortcut keys are as follows:

Table: Default Occupied Shortcut Keys

Shortcut keys	Function
Esc	Cancel
Ctrl+Z	Undo
Ctrl+Y	Redo

Delete	Delete

2.2.4.2 Language

Function Description:

Support multilingual interface switching and content adaptation to meet user localizatio n needs (e.g., Chinese/English), ensuring barrier-free cross-regional collaboration and en hancing the international user experience.

Operation Steps:

① Click File -> Settings -> Language to open the language settings interface.

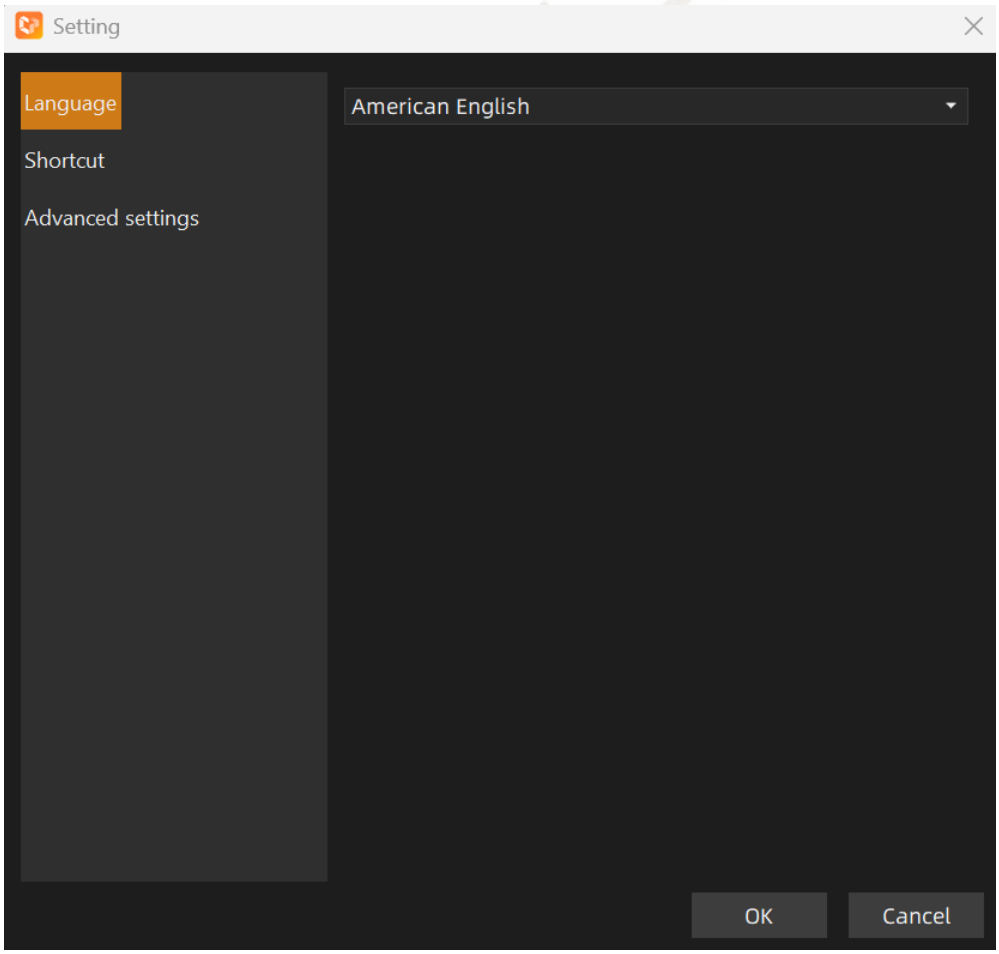


Figure: language

② Select a language from the drop-down box in the language options, click "OK" i n the bottom right corner. In the pop-up restart prompt box, click "OK". The lan guage modification will take effect after restarting (if the current project is not sa ved, you need to save or discard the project after clicking "Confirm Restart").

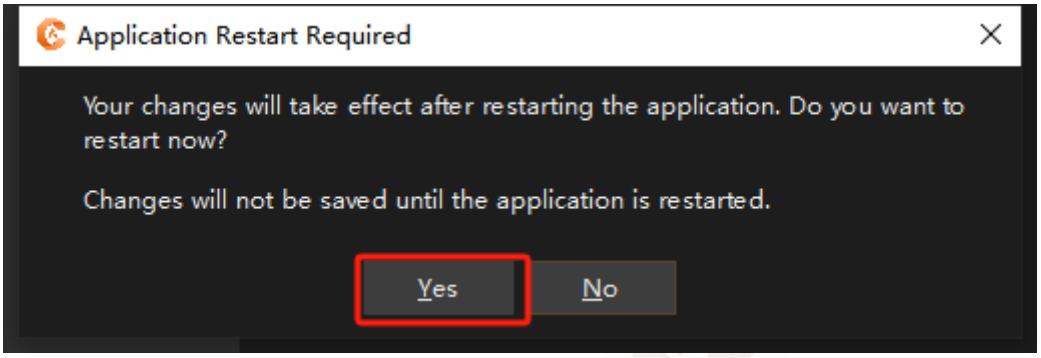


Figure: Restart After Language Modification

2.2.4.3 Advanced Settings

Function Description:

The purpose of the User Experience Experience Improvement Program is to analyze abnormal information during product usage to enhance product stability, and to analyze product usage to improve product usability, thereby providing users with more stable products and better user experience. To this end, the software will check "User Experience Improvement Program" by default, and will collect software operation information (start-up time, shutdown time, crash time, operation records such as: create new project, open project, save project, open vector, open point cloud, open DEM, open image, open OSGB model, open OSGB folder, create new drawing, open drawing, save drawing, save drawing as) and network information.

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

Operation Steps:

1.Click File -> Settings -> Advanced Settings, check the option of user experience im provement program.

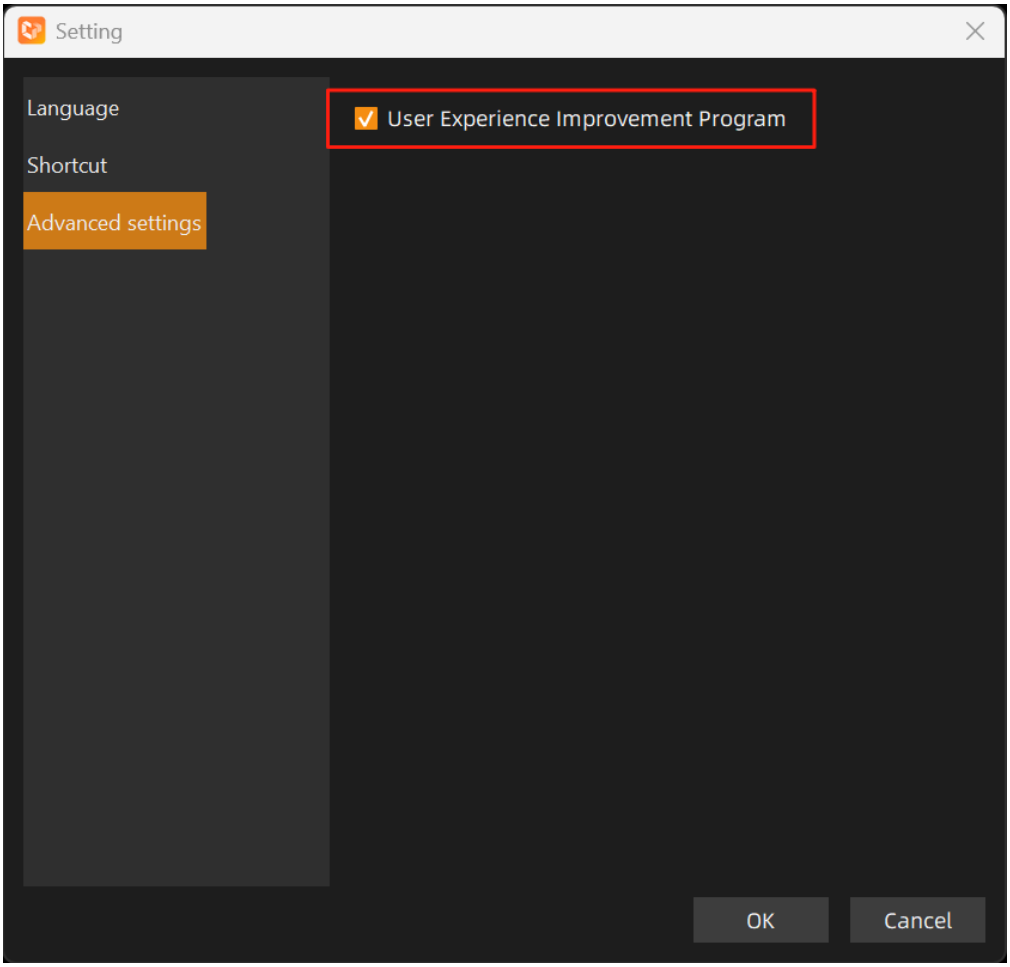


Figure: Advanced Settings

2. The "User Experience Improvement Program" is checked by default, and the software will collect operation information.

3. After changing the check status of the "User Experience Improvement Program", click "Cancel" or exit the window from the upper right corner, and a "Close" dialog box will pop up. Click "No" or exit the window in the upper right corner of the "Close" dialog box to directly close it and return to the "Settings" dialog box interface, where the "User Experience Improvement Program" will display the changed status.

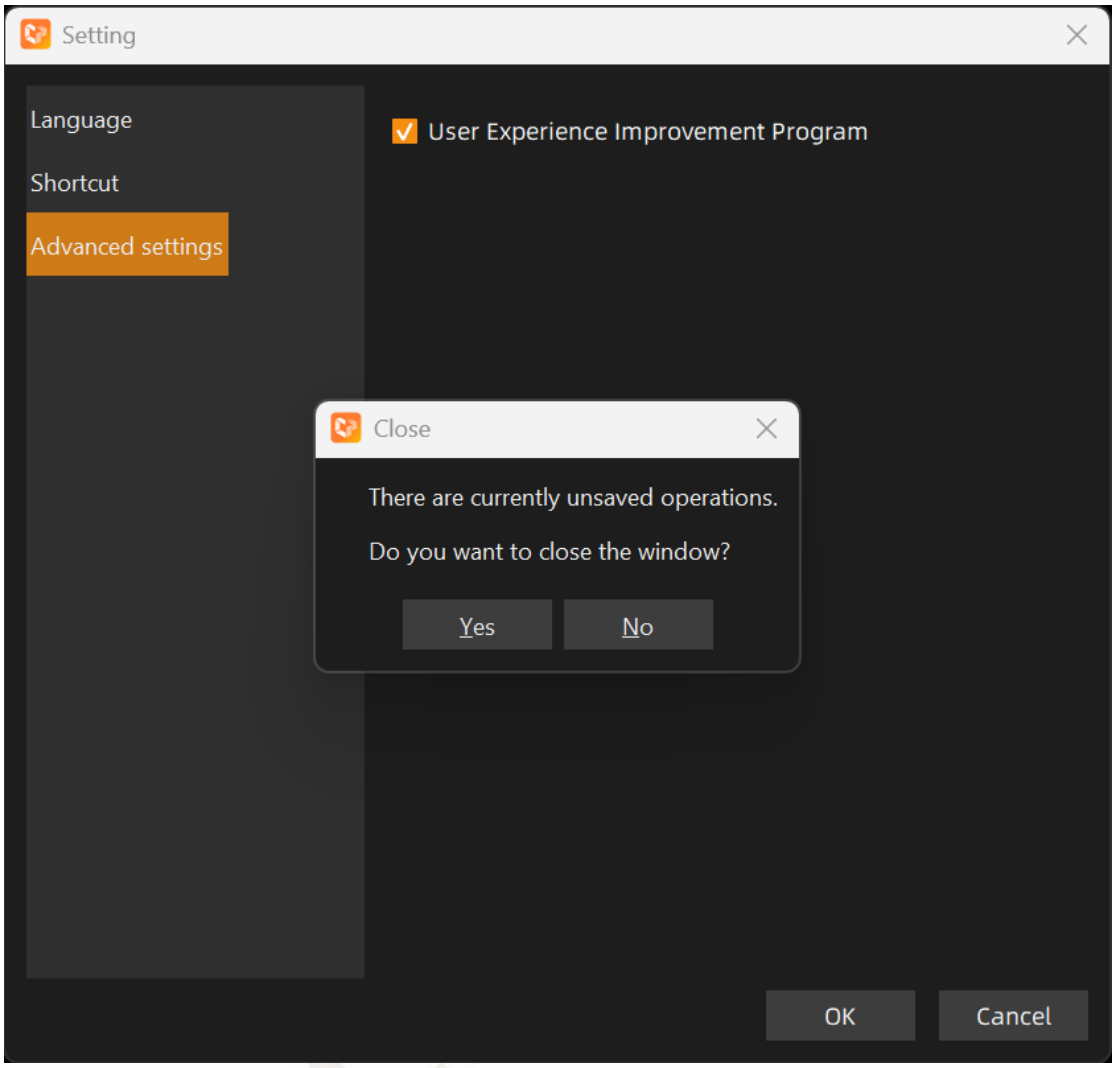


Figure: Close Dialog

4. After changing the check status of the "User Experience Improvement Program", click the "Ok" button to directly close both the "Close" dialog box and the "Settings" dialog box. When the function is opened again, the "User Experience Improvement Program" will display the changed status.

2.3 Base Module

2.3.1 Data Exchange

2.3.1.1 Import Point Cloud

Function Description:

Open point cloud data and display it in the view. Supported point cloud data formats include *.hpc, *.las, *.laz, and *.codata.

Operation Steps:

① Click Base -> Import Point Cloud to pop up the "Select Point Cloud Data File" path selection dialog box.

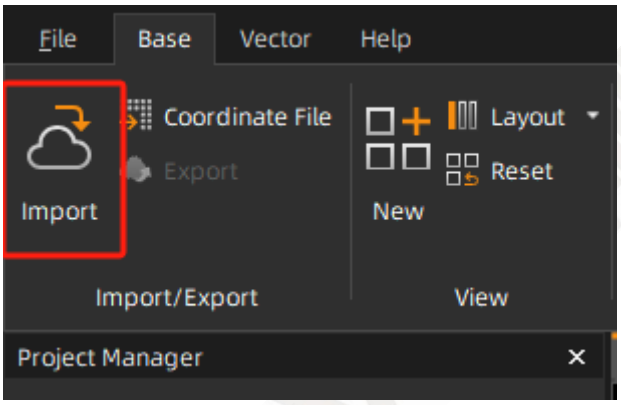


Figure: Import Point Cloud

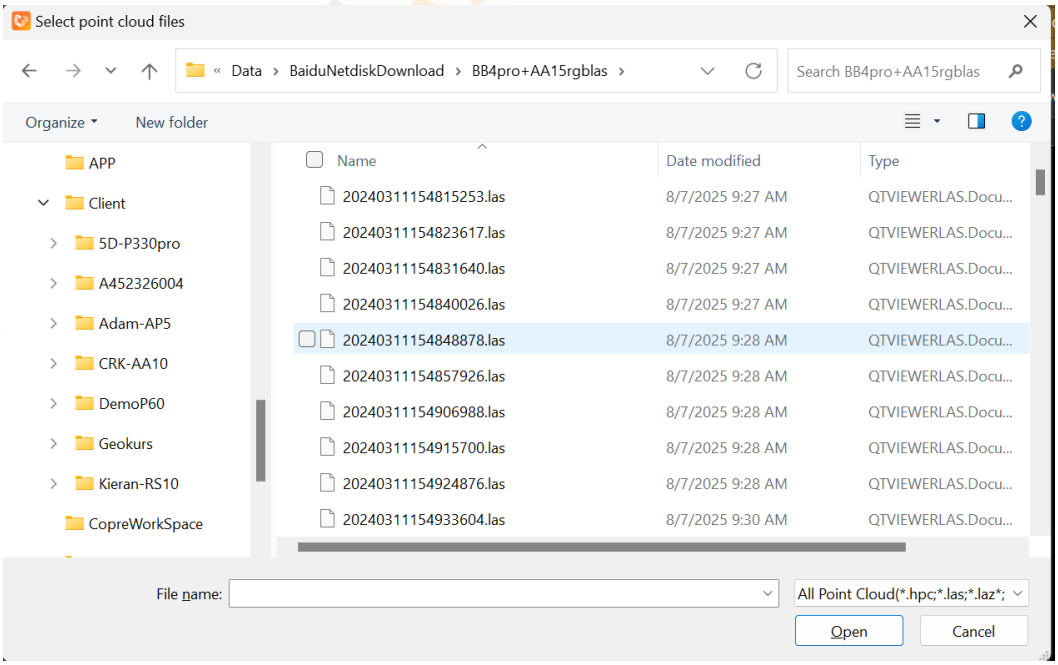


Figure: Select Point Cloud Data File Dialog Box

② In the path selection dialog box, select point cloud data in .hpc/.las/.laz/.codata format, 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:

Load coordinate data in .dat, .csv, or .txt format into the currently drawing and display it in the view.

Operation Steps:

① Click Base -> Import/Export -> Coordinate File to pop up the path selection dialog box for importing coordinate files.

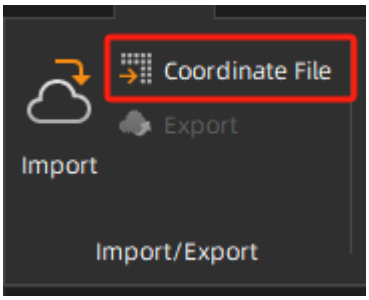


Figure: Coordinate File Button

② Select a coordinate file in .txt, .dat, or .csv format, click "Open". The "Import Coordinate File" dialog box will appear in the software interface.

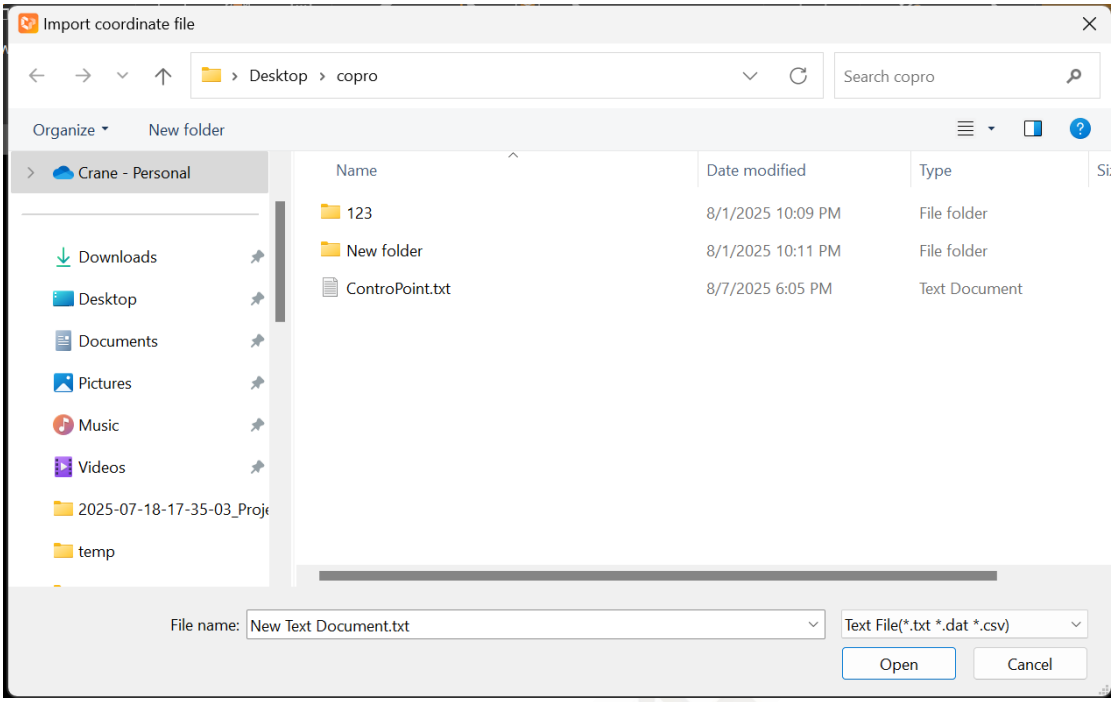


Figure: Open Coordinate File

③ In the "Import Coordinate Point" dialog box, select corresponding X, Y, Z axis. Click "OK" to import the coordinate file into the currently drawing and display it in the view.

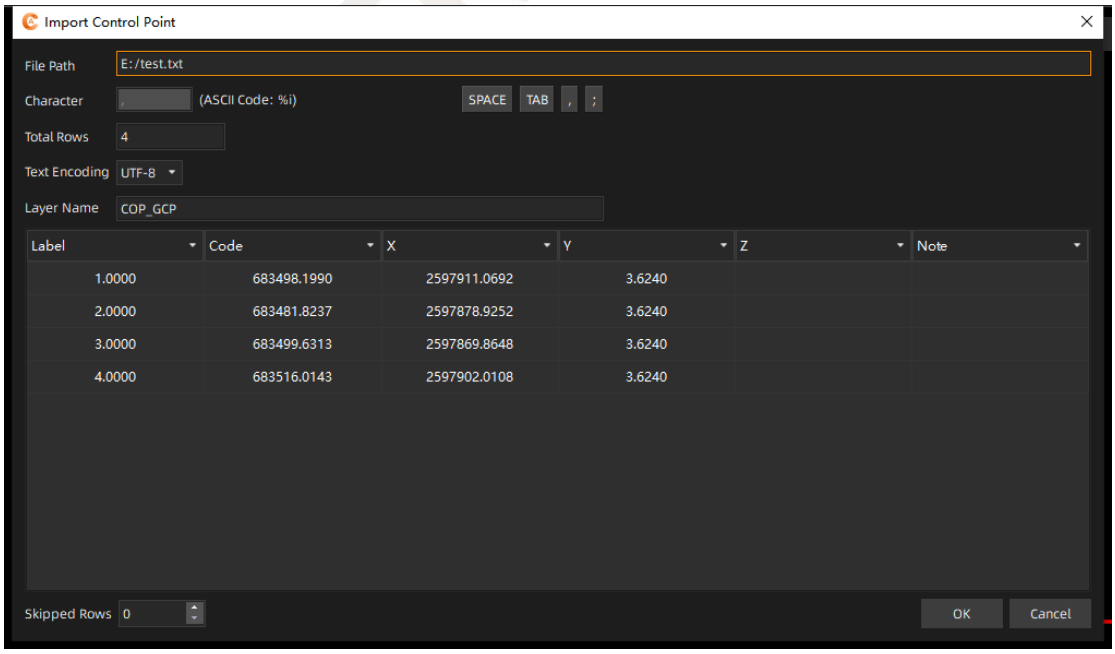


Figure: Import Coordinate File Dialog Box

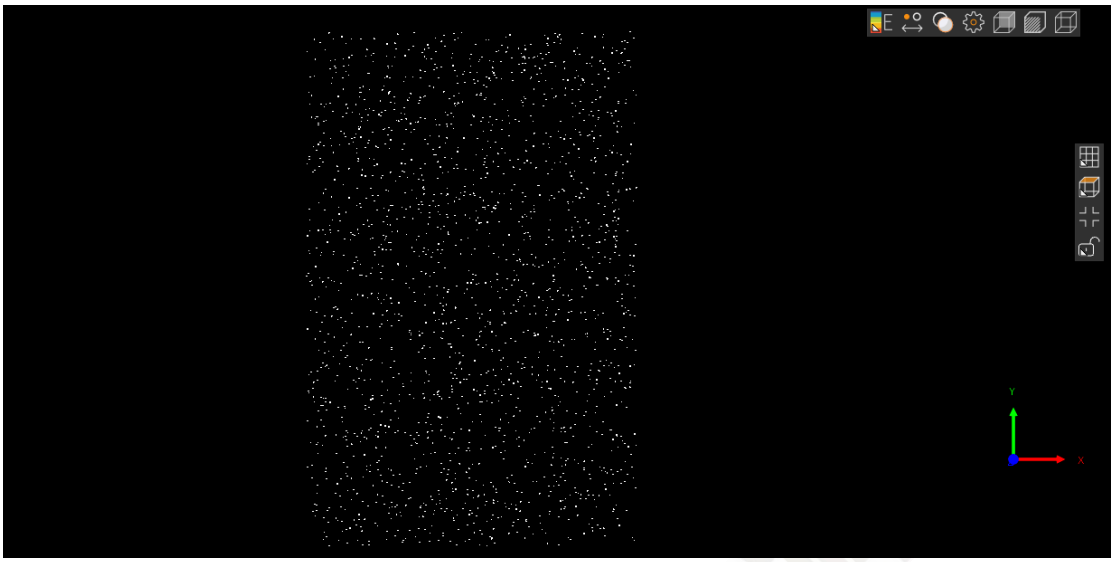


Figure: Coordinate File Display Effect

2.3.2 View

This section introduces view management functions, including creating a new view window, adjusting view window layout, and resetting the layout.

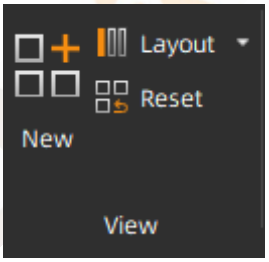


Figure: View Management Buttons

2.3.2.1 New View

Function Description:

Create and open a new view.

Operation Steps:

① Click Base -> Click “New” to create a new view.

② Drag point cloud, vector, DEM, image, or model data from the project management panel to 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 modes: Tab Layout, Tile Layout, Horizontal Layout, and Vertical Layout.

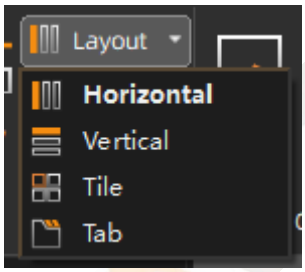


Figure: Layout Button Options

Operation Steps:

① Click Base -> New View to create at least two view windows.

② Click Base -> Layout, and select Horizontal Layout, Vertical Layout, Tile Layout, or Tab Layout to view different layouts.

Note:

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

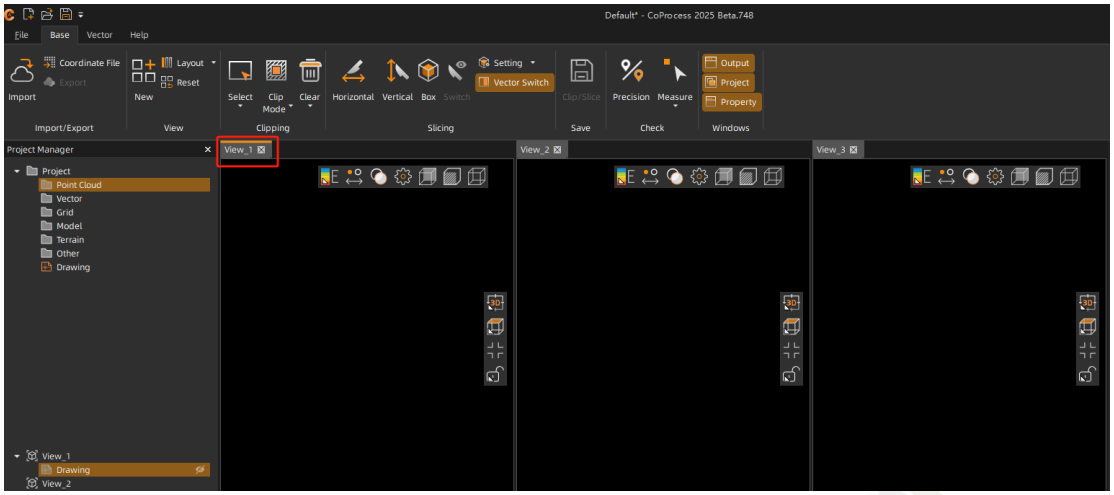


Figure: Current Active View Mark

2.3.2.3 Reset

Function Description:

Restore multiple views to the default layout (Tab Layout).

Operation Steps:

① Click Base -> Reset.

② The multiple views in the software interface will return to the initial state (Tab L ayout).

2.3.3 Clipping

2.3.3.1 Rectangle Selection

Function Description:

Select point clouds by drawing a rectangular frame.

Operation Steps:

① Load the point cloud, click Base -> Clipping -> Select -> Rectangle to activate t he rectangle selection command.

②In the view window, left-click to select the top-left corner of the rectangle, hold and drag the mouse until the bottom-right corner is reached. Release the mouse, and the point clouds in the rectangular area will be highlighted.

③After the first selection, you can continue to draw rectangles. The selection area will be added to or subtracted from the existing selection based on the subtract mode.

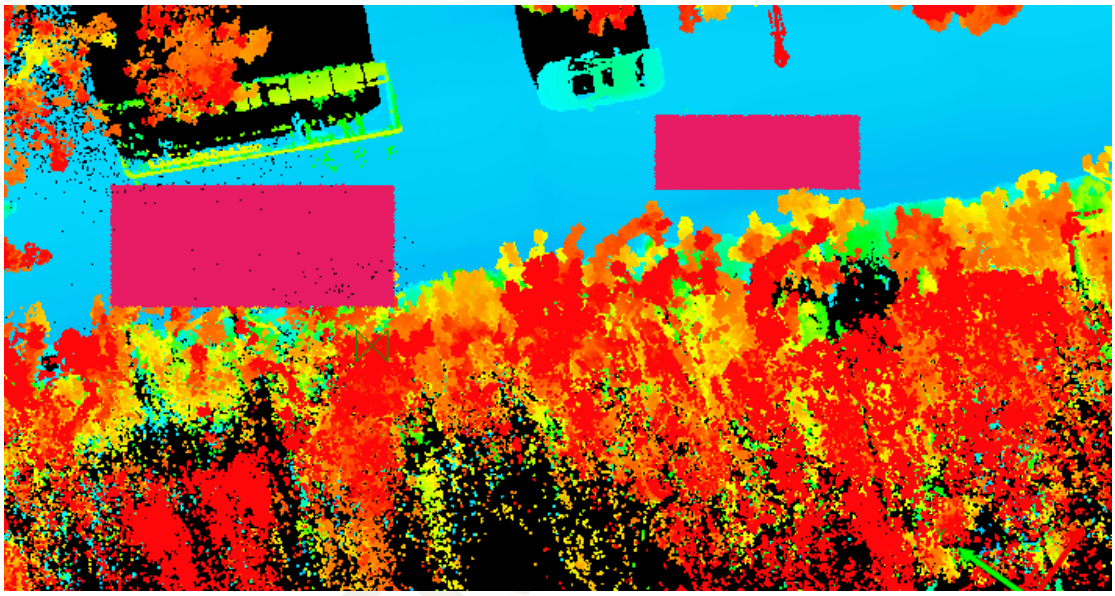


Figure: Rectangle Selection of Point Cloud

2.3.3.2 Polygon Selection

Function Description:

Select point clouds by drawing a polygon.

Operation Steps:

① Load the point cloud, click Base -> Clipping -> Select -> Polygon to activate the polygon selection command.

② Left-click sequentially to select polygon vertices. Double-click the last vertex to end the polygon selection; the selected area will be highlighted (red) as shown below.

③ If a vertex is incorrectly selected, press Ctrl+Z to cancel the last selected point (supports multiple consecutive cancellations).

④ After the first selection, you can make multiple selections based on the initial sel ection. The selection area will be added to or subtracted from the existing selecti on based on the subtract mode.

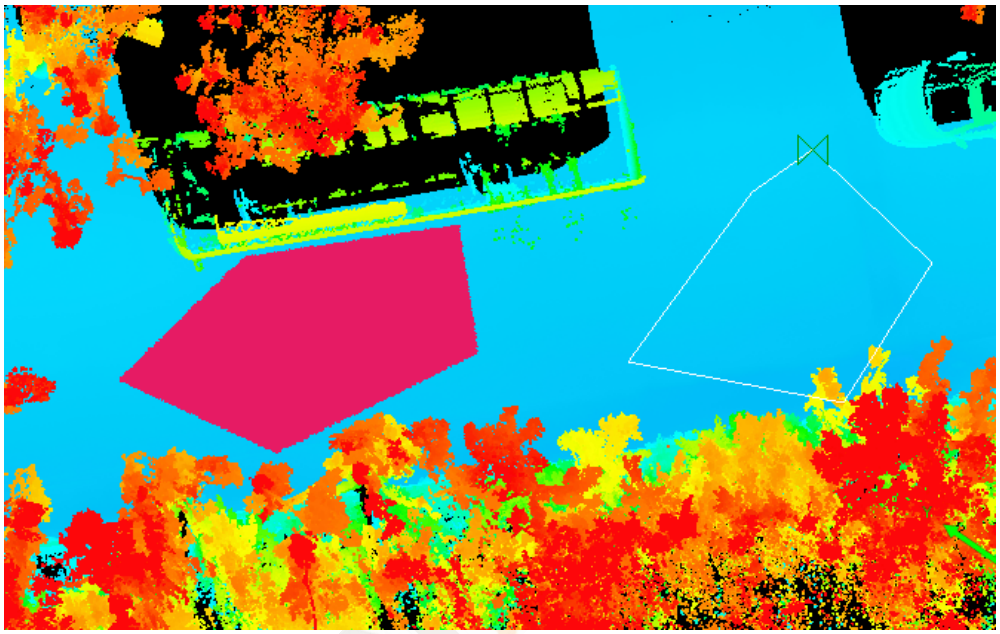


Figure: Polygon Selection of Point Cloud

2.3.3.3 Lasso Selection

Function Description:

Select point clouds by drawing a lasso.

Operation Steps:

① Load the point cloud, click Base -> Clipping -> Select -> Lasso to activate the l asso selection command.

② Left-click once, then move the mouse. All point clouds within the closed area for med during mouse movement will be selected. Left-click again to complete a sin gle lasso selection; the selected area will be highlighted (red) as shown below.

③ After the first selection, you can make multiple selections based on the initial sel ection. The selection area will be added to or subtracted from the existing selecti on based on the subtract mode.

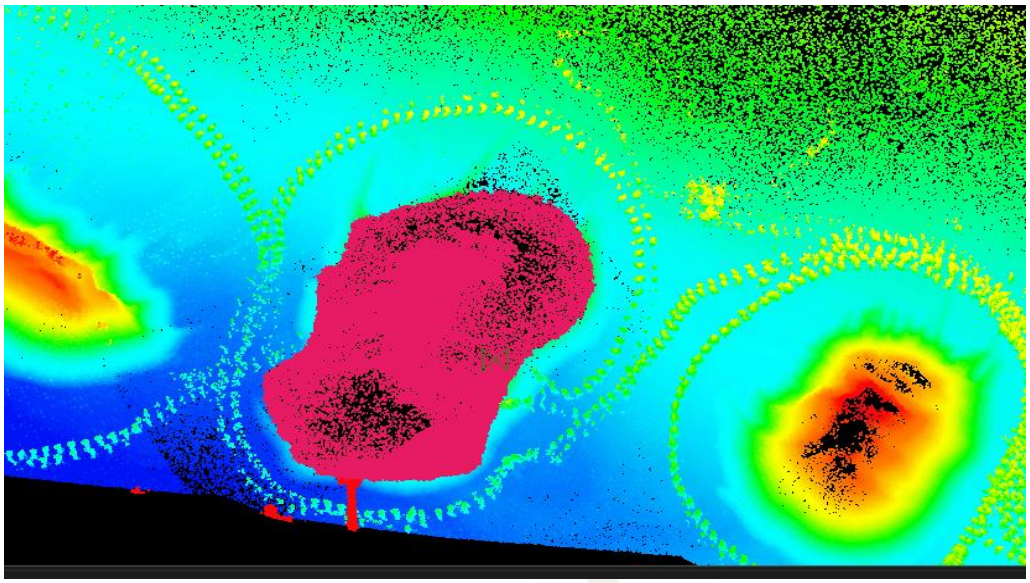


Figure: Lasso Selection of Point Cloud

2.3.3.4 Vector Selection

Function Description:

Select point clouds by selecting a range line.

Operation Steps:

① Load the point cloud and range line, click Base -> Clipping -> Select -> Vector selection to activate the range line selection command.

② Select the range line in the view (supports point selection and frame selection). T he point clouds within the selected range line will be selected; the selected area will be highlighted (red) as shown below.

③ After the first selection, you can make multiple selections based on the initial sel ection. The selection area will be added to or subtracted from the existing selecti on based on the subtract mode.

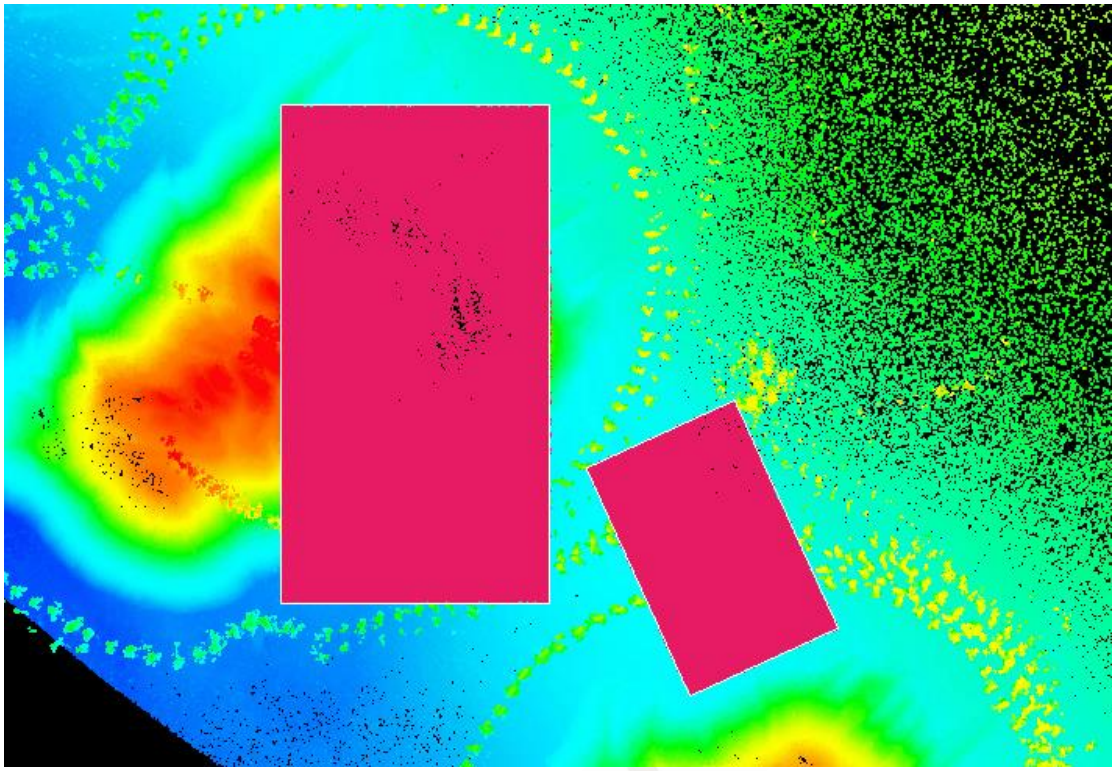


Figure: Range Line Selection of Point Cloud

2.3.3.5 Inner Clipping

Function Description:

Clip off point clouds outside the selection range.

Operation Steps:

① Activate the selection function to obtain the selection area; execute the inner clipping function. The clipping effect is shown in the figure.

② After one clipping, you can continue to select and clip the clipped result multiple times.

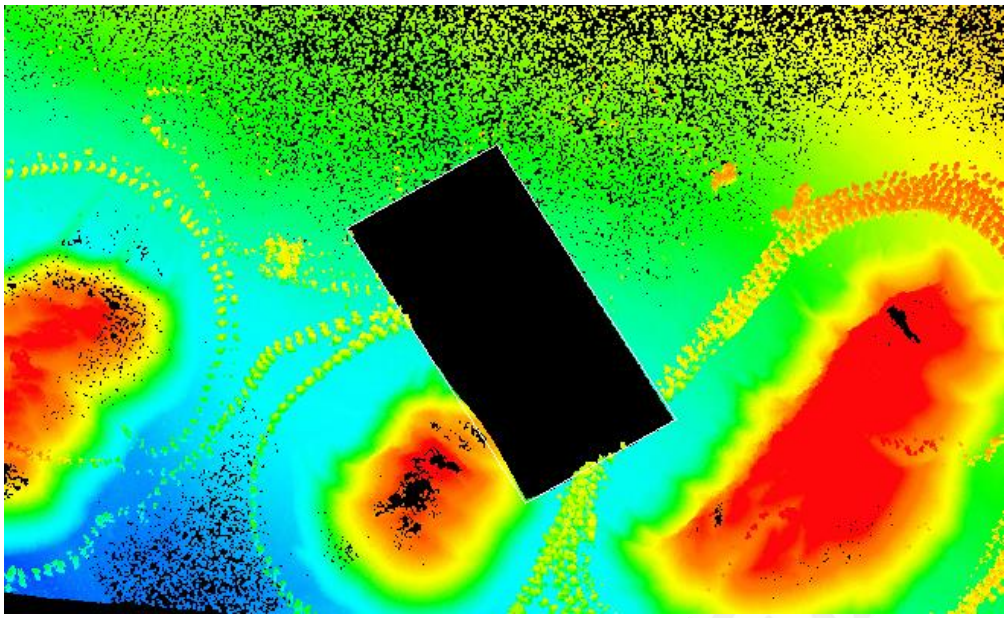


Figure: Inner Clipping Result

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 Clipping

Function Description:

Clip off point clouds inside the selection range.

Operation Steps:

① Activate the selection function to obtain the selection area; execute the outer clipping function.

② After one clipping, you can continue to select and clip the clipped result multiple times.

1.

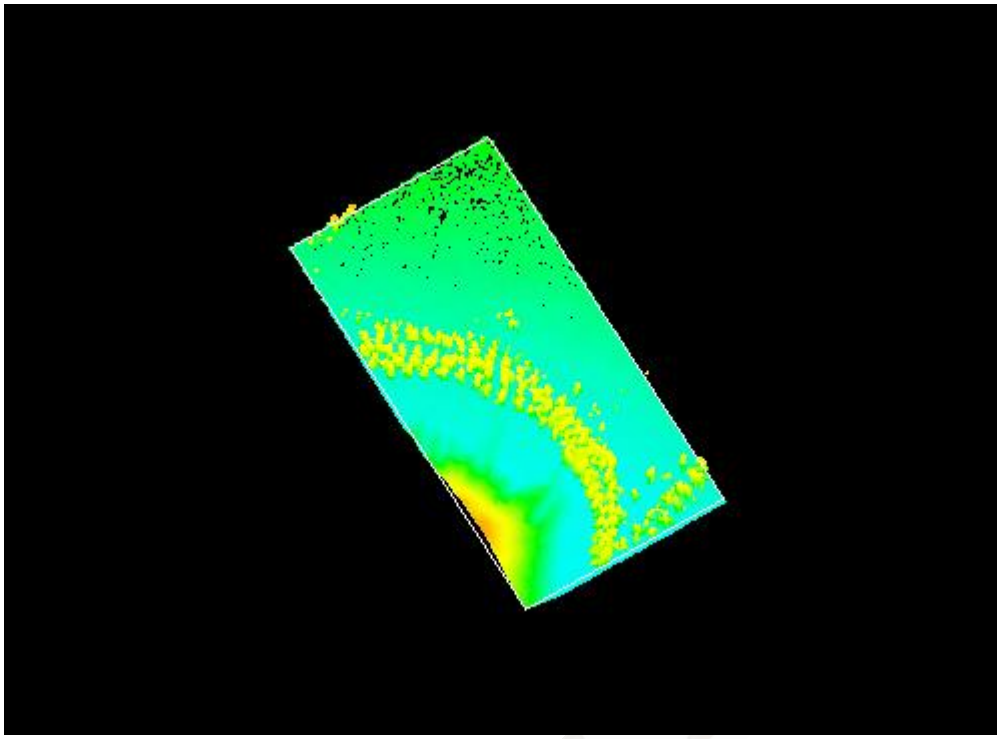


Figure: Outer Clipping Result

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 Deselect

Function Description:

This function works with Rectangle Selection, Polygon Selection, Lasso Selection, and Vector Selection to control whether the current selection is added to or subtracted fro m the existing selection. The deselection mode is only selectable when a selection co mmand (Rectangle Selection, Polygon Selection, Lasso Selection, Range Line Selectio n) is active.

Operation Steps:

① By default, the deselect button is inactive, and selections are in add mode. Each s election will expand the selected area.

② When the deselection function is activated, it enters the deselection state, and the final result of the selection is that the overlapping part of the currently selected ar ea is subtracted from the already selected area.

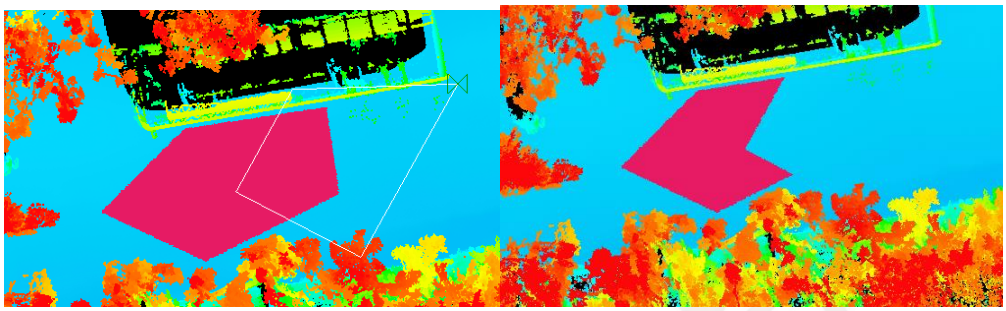


Figure: Deselect

2.3.3.8 Clear

Function Description:

Cancel and clear all selection operations and clipping results.

Operation Steps:

① Execute selection or clipping operations; the selected area or clipping result will b e highlighted.

② Execute the clear clipping command to immediately delete all selections and clippi ng 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:

Create a new horizontal slice by selecting a point.

Operation Steps:

① Click Base -> Slicing -> Horizontal. The slice settings panel will appear on the right side of the software.

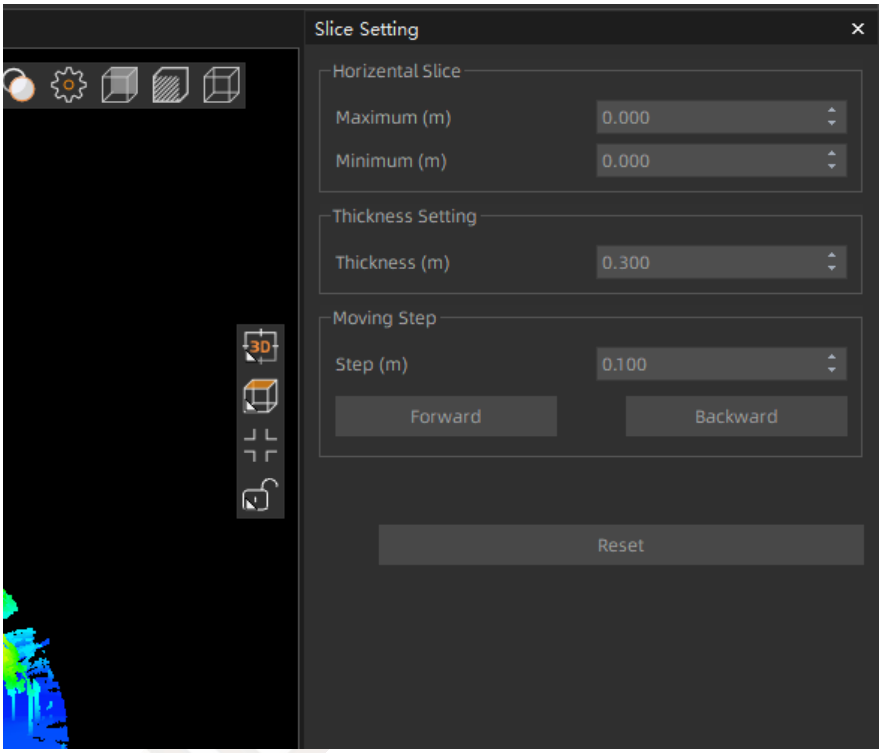


Figure: Activate Horizontal Slice

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.

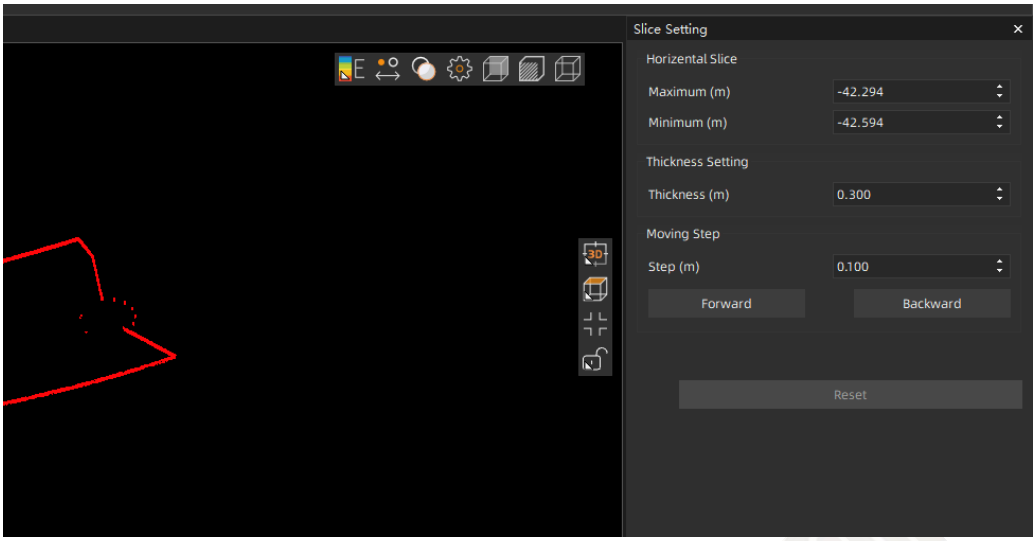


Figure: Horizontal Slice

③ In the slice settings panel, modify the maximum and minimum values of the elevation range and the slice thickness to accurately update the horizontal slice result.

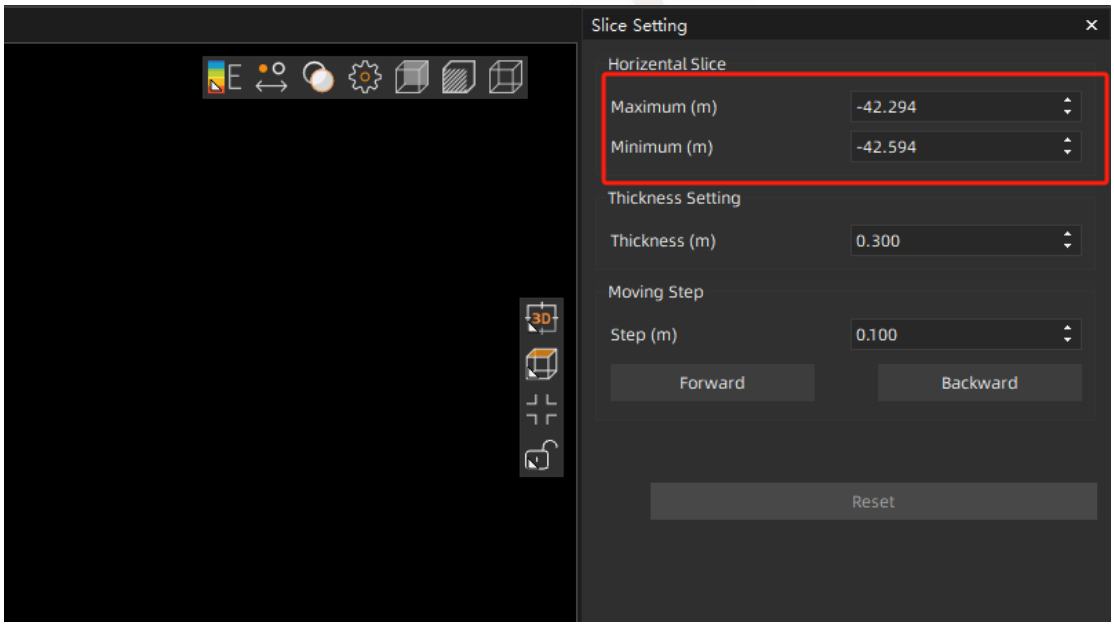


Figure: Modifying Elevation Range for Horizontal Slice

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

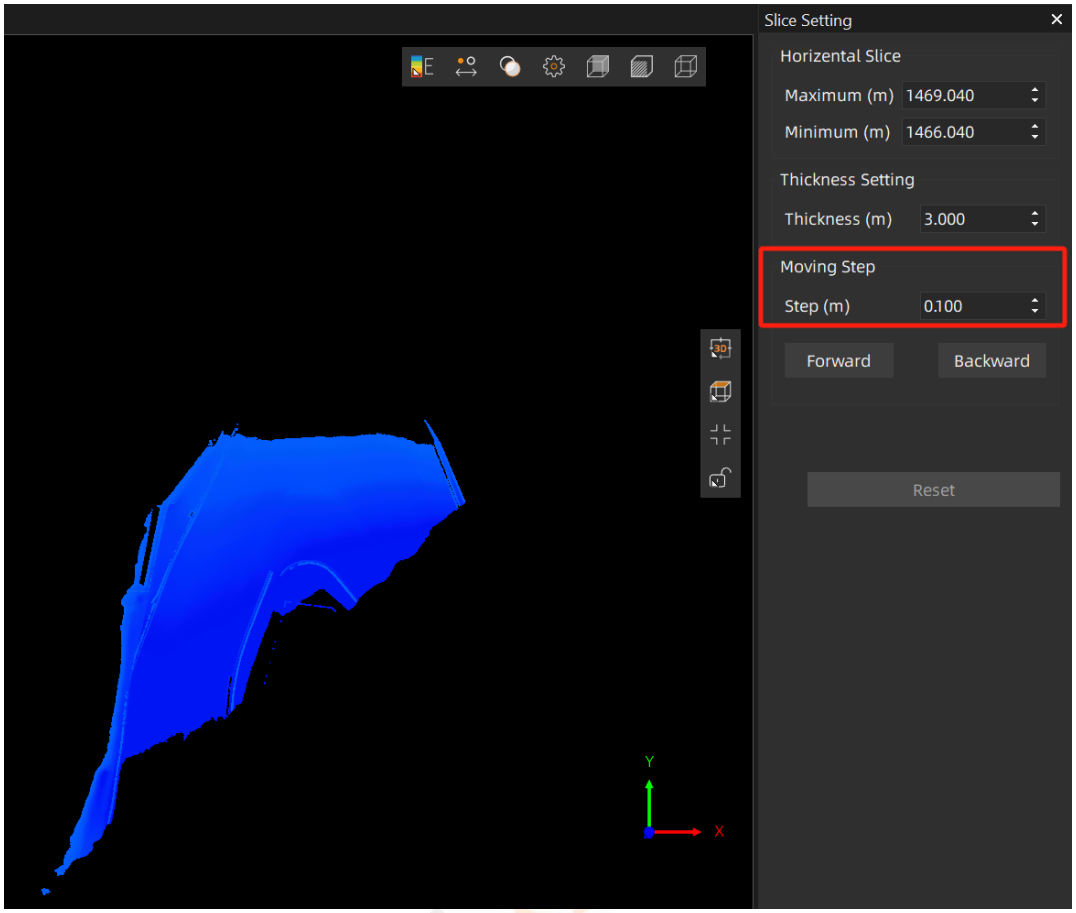
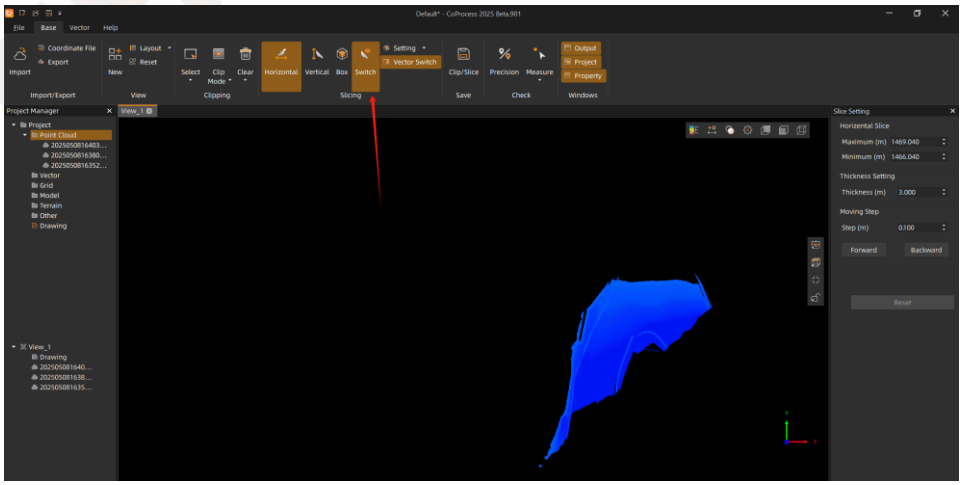


Figure: Modify Movement Step for Horizontal Slice

⑤ Click "Switch" to display the point cloud before horizontal slicing; click "Switch" again to display the point cloud after horizontal slicing.



Note:

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

2.3.4.2 Vertical

Function Description:

Create a vertical slice.

Operation Steps:

① Click Base -> Slicing -> Vertical to enter the vertical slicing command. The view will automatically switch to top view, and the slice settings panel will appear on t he right.

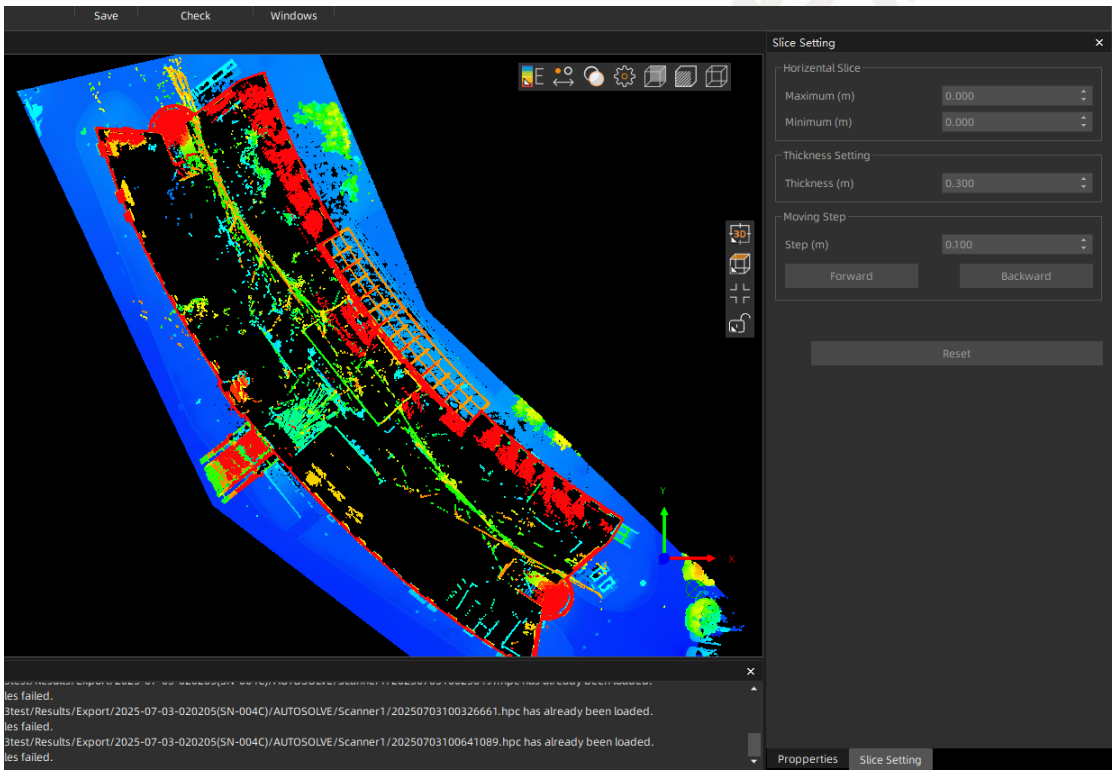


Figure: Activate Vertical Slice

② Left-click sequentially to select two points and create a vertical slice. Hold Ctrl a nd scroll the mouse wheel to move the slice; hold Shift and scroll the mouse wh eel to adjust the display thickness of the slice.

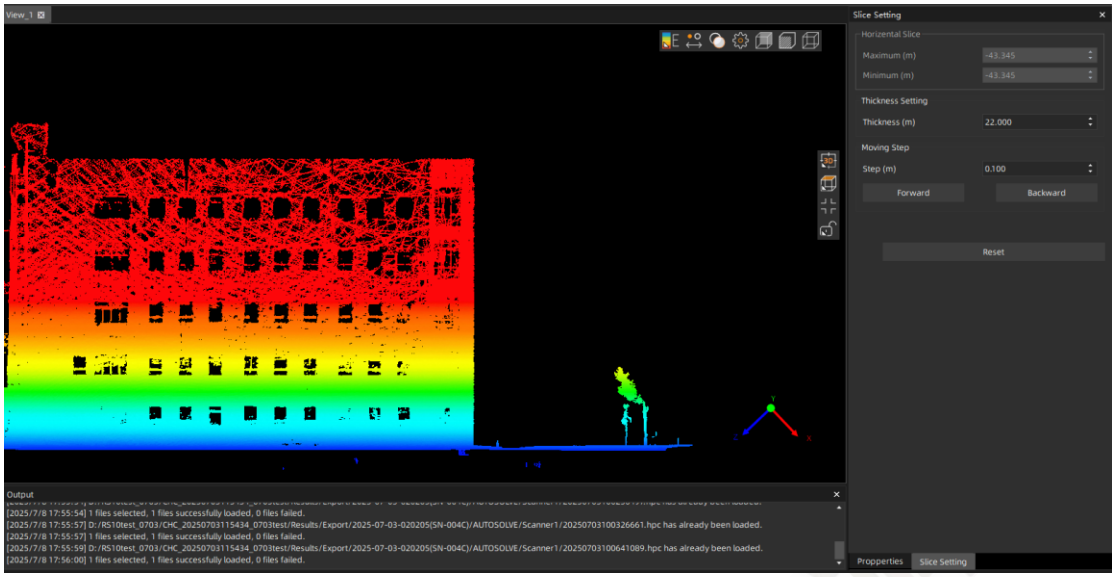


Figure: Vertical Slice

③ In the slice settings panel, modify the slice thickness to directly update the vertical slice result.

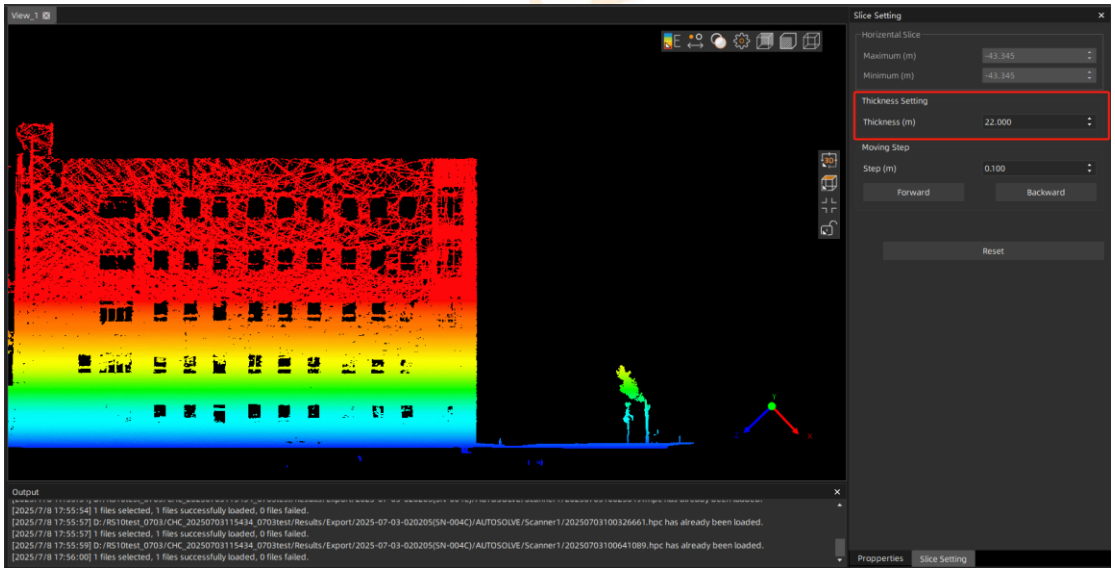


Figure: Modify Vertical Slice Thickness

④ Modify the movement step, click "Forward" or "Backward" to directly update the vertical slice result.

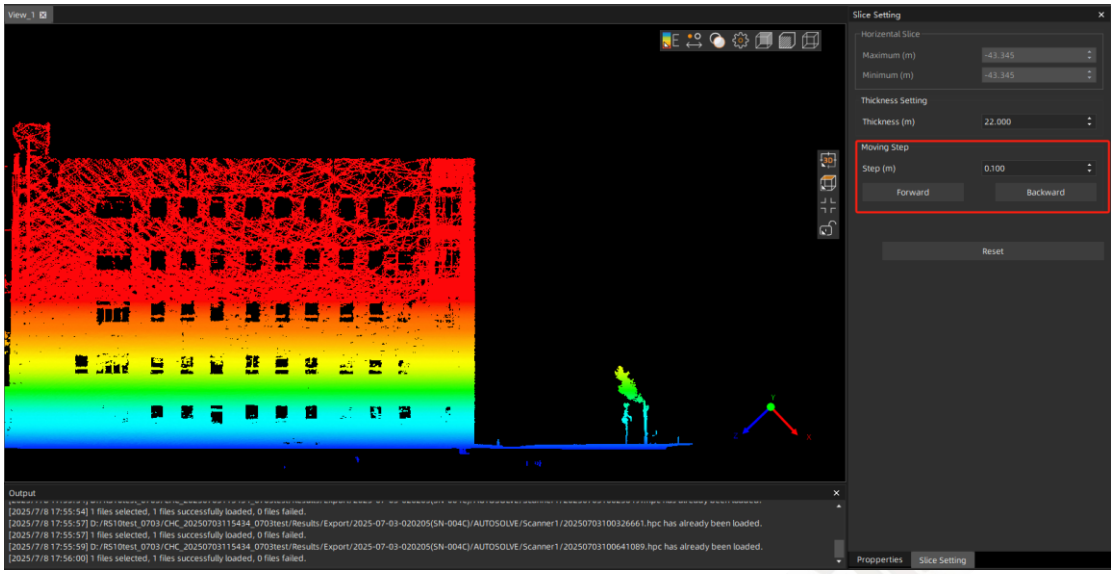


Figure: Modify Movement Step for Vertical Slice

⑤ Click "Reset" in the slice settings to restore the view of the point cloud after vert ical slicing to the view after the first slicing.

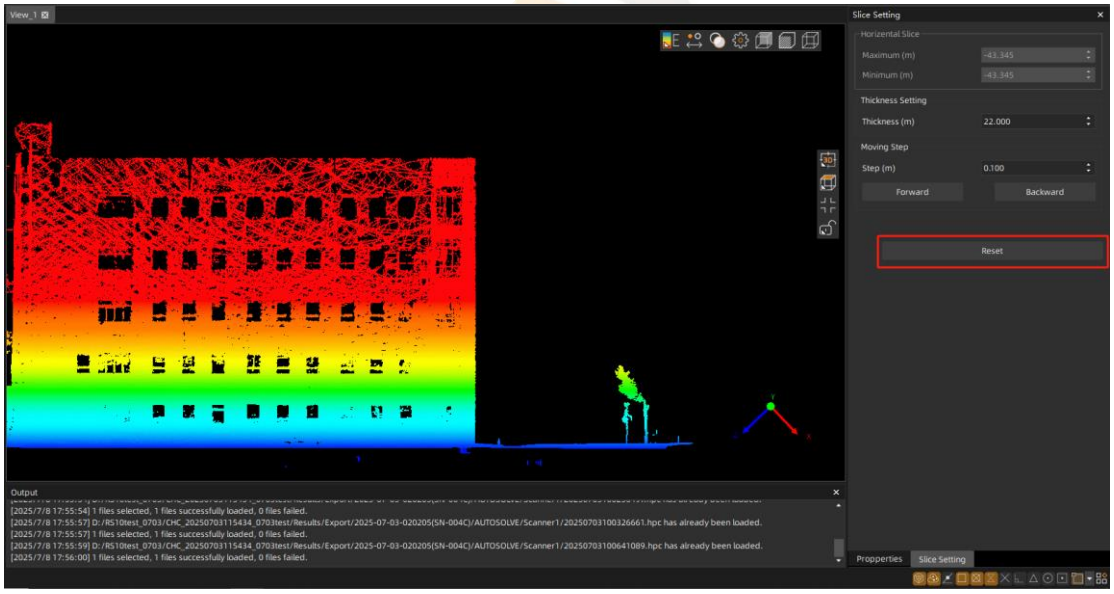


Figure: Vertical Slice Reset Effect

⑥ Click "Switch" to display the point cloud before vertical slicing; click "Switch" ag ain to display the point cloud after vertical slicing.

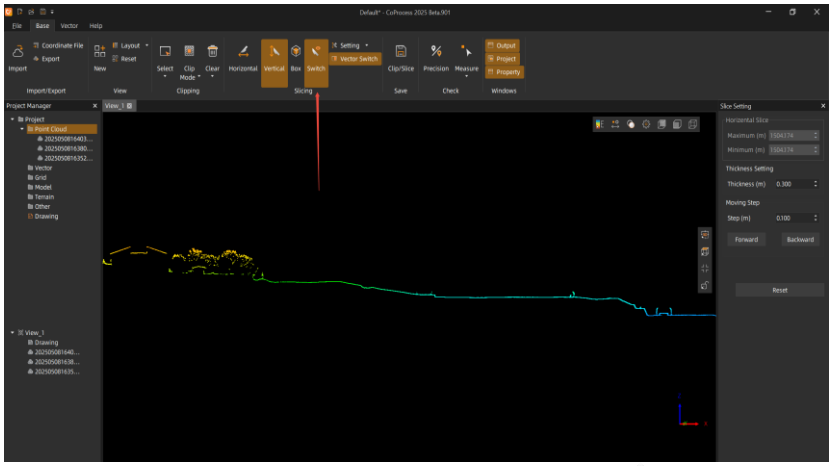


Figure: Vertical slice reset effect

Note:

For vertical slice thickness, the maximum and minimum values of the elevation range are grayed out and cannot be modified.

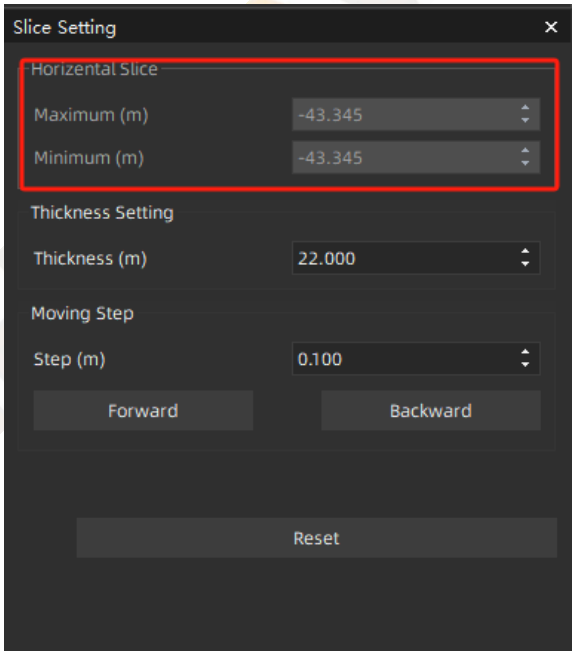


Figure: Grayed-Out Elevation Range for Vertical Slice

2.3.4.3 Bounding Box

Function Description:

Create a bounding box slice.

Operation Steps:

① Click Base -> Slicing -> Bounding Box to enter the bounding box slicing command. The view will display the bounding box frame, corner points, center point, and plane grips, and the bounding box slice settings panel will appear on the right.

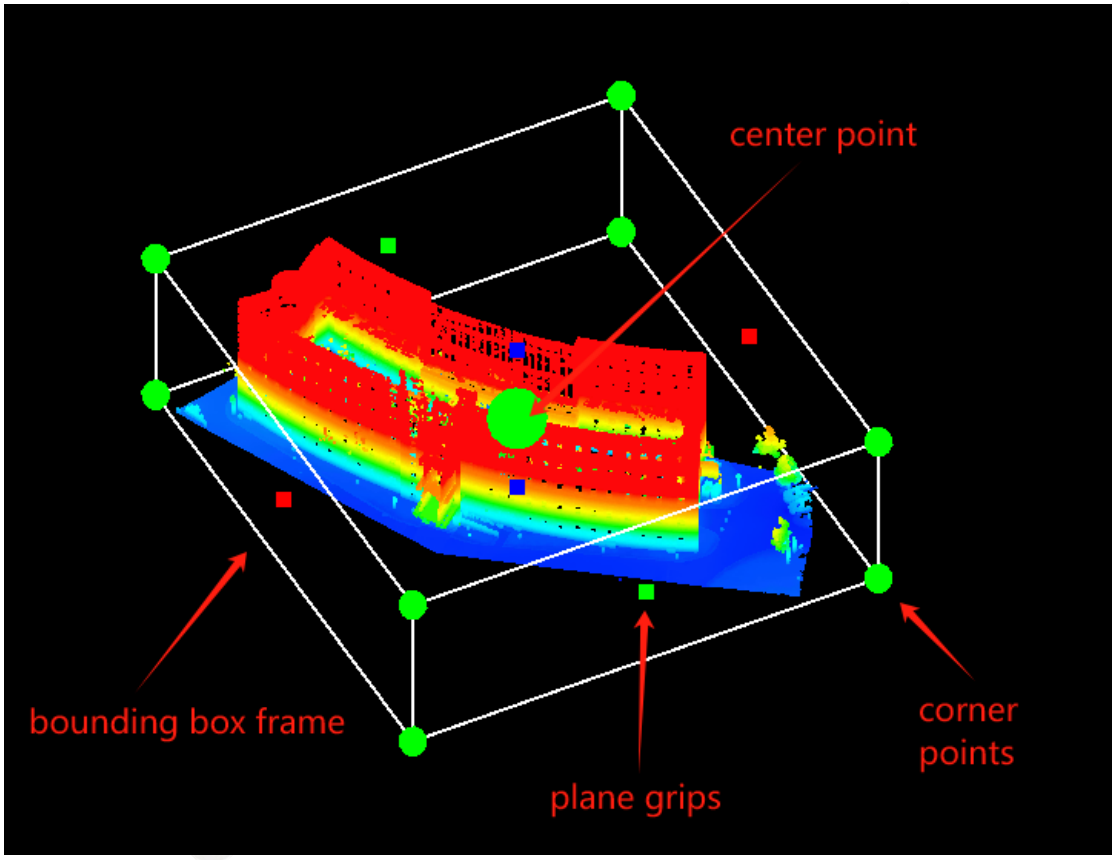


Figure: Bounding Box Slice

② Use the mouse to select a corner point. Drag the corner point outside the bounding box: the bounding box expands, and the point cloud remains unchanged. Drag the corner point inside the bounding box: the bounding box shrinks, and the point cloud is clipped to the size of the bounding box. During dragging, only the bounding box and point cloud are displayed in the view; all corner points, plane grips, and the center point are hidden.

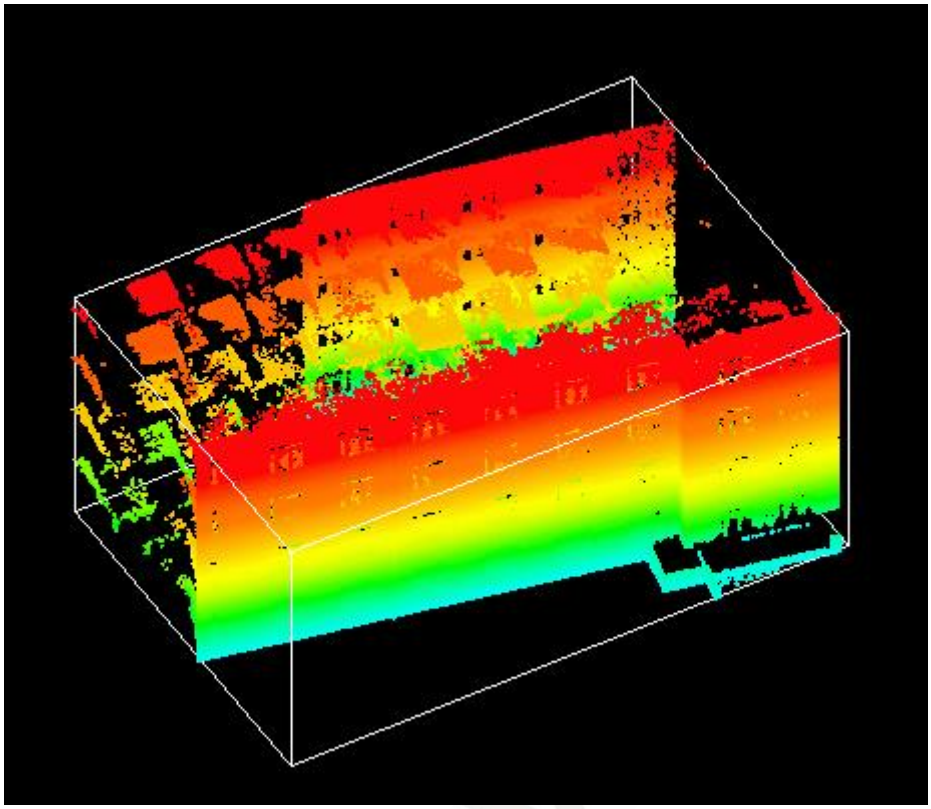


Figure: Effect of Moving Corner Points

③ Place the mouse on the plane grip of the bounding box face. Drag the grip outside the bounding box: push the slice outward, the point cloud remains unchanged, and this face of the bounding box moves outward. Drag the grip inside the bounding box: push the slice inward, the point cloud is clipped smaller, and this face of the bounding box moves inward.

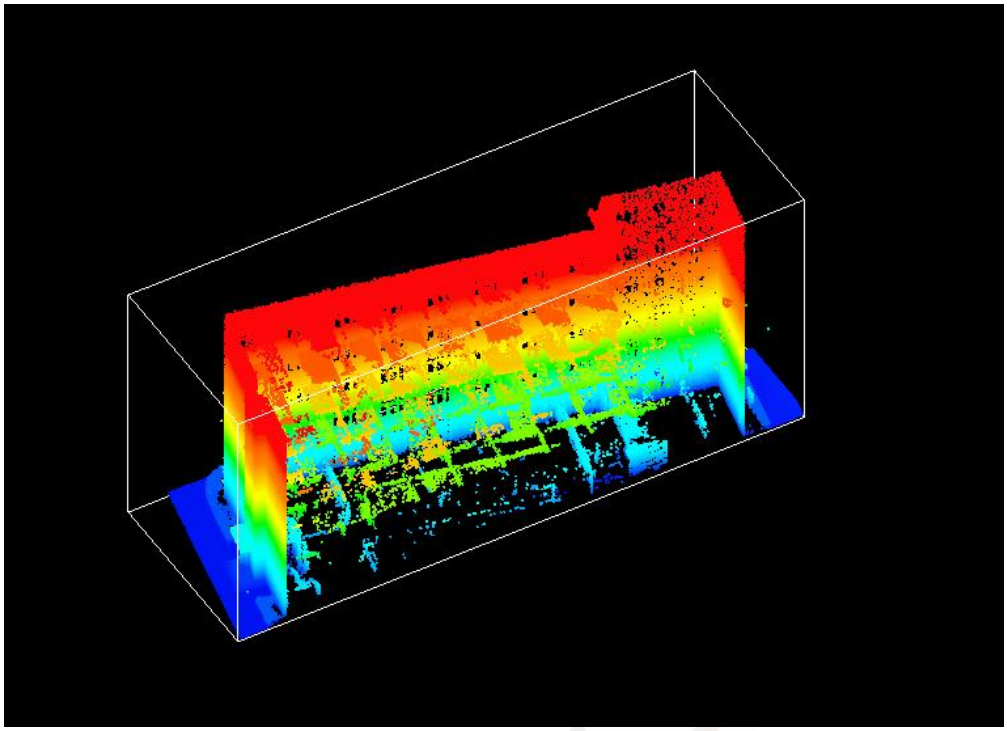


Figure: Effect of Moving Plane Grips

④ Move the mouse close to the center point of the bounding box, left-click the butt on to freely move the bounding box. The position and size of the point cloud re main unchanged; the bounding box is used to clip the point cloud, with only the point cloud inside the bounding box retained and the point cloud outside not disp layed.

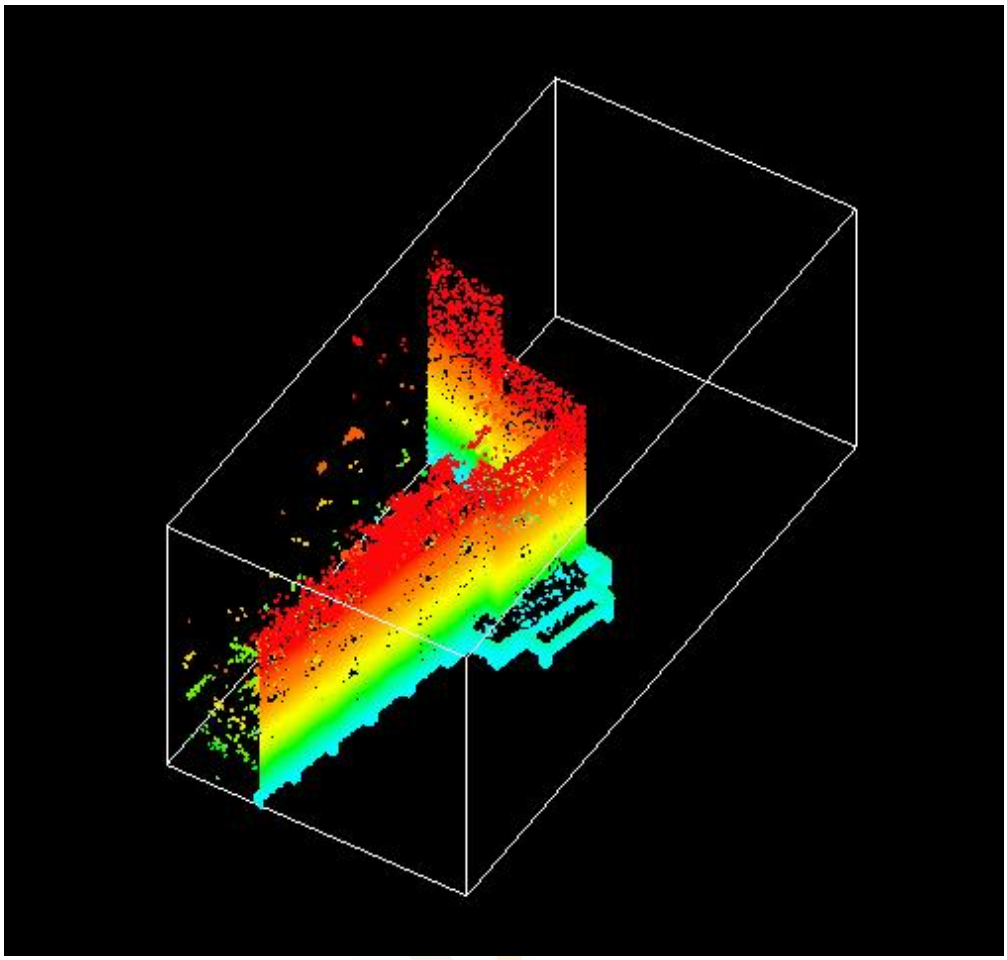


Figure: Effect of Moving Center Point

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

2.3.4.4 Bounding Box Settings

Function Description:

Directly modify the bounding box by adjusting parameters in the bounding box setting s panel.

Operation Steps:

① Click Base -> Slicing -> Setting to select the bounding box setting. The settings panel will appear on the right.

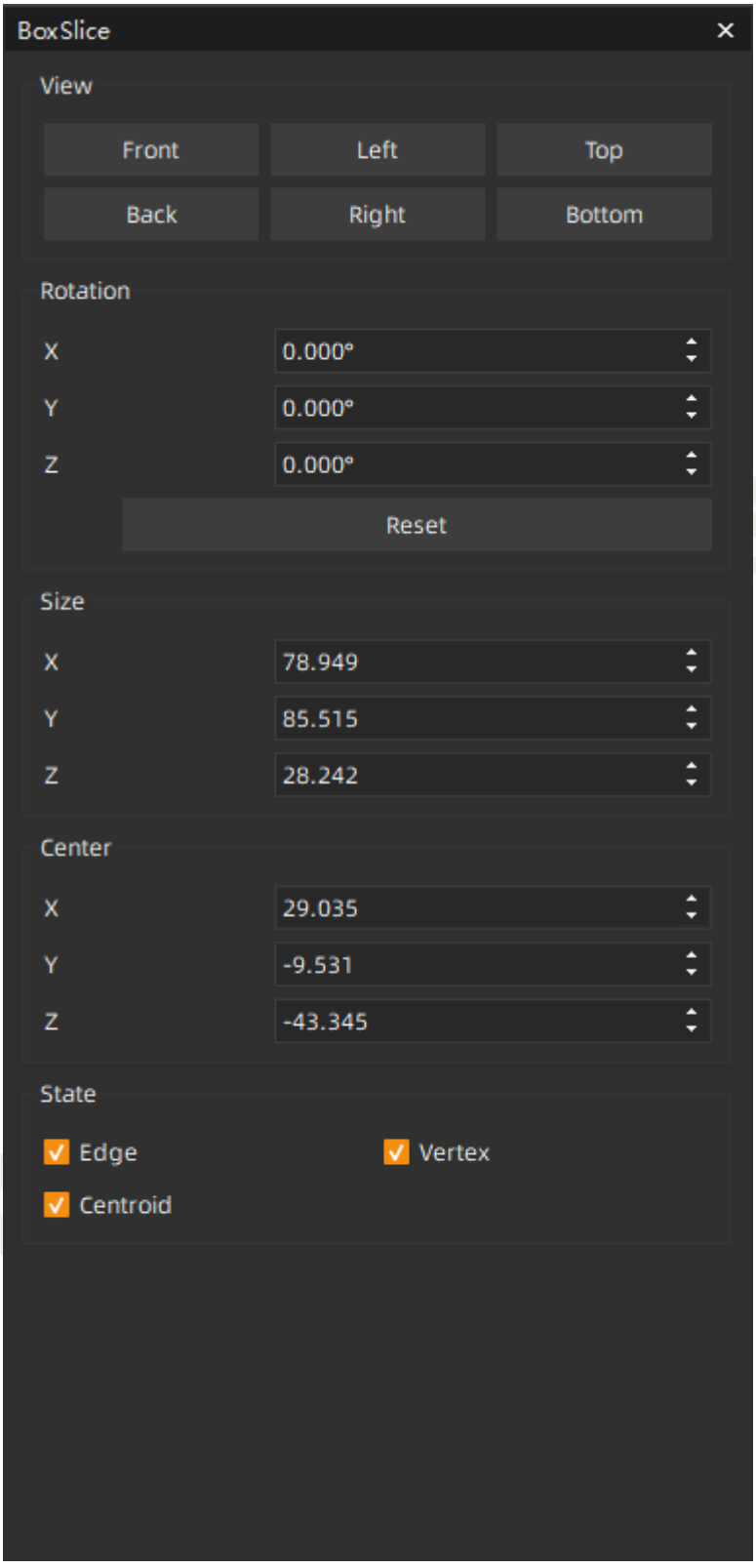


Figure: Bounding Box Settings Pane

② Click "Front View", "Left View", "Top View", "Back View", "Right View", or "Bottom View" to switch the display angle of the bounding box.

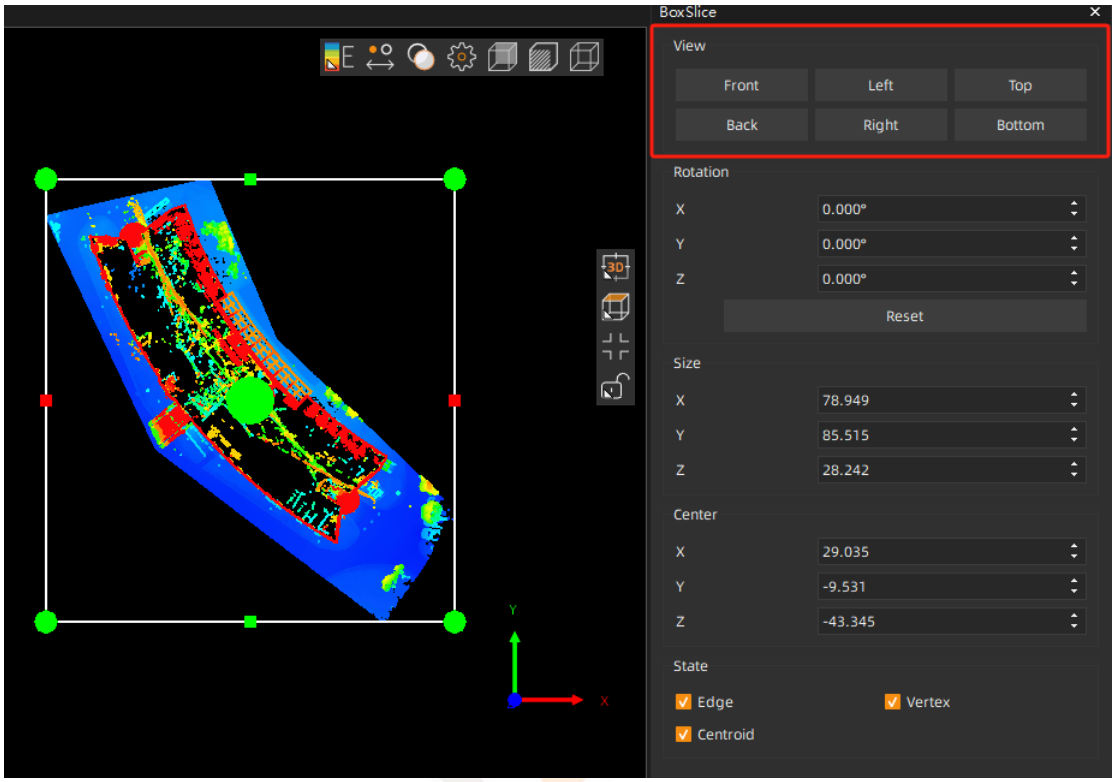


Figure: Top View Effect

③ Place the mouse on the X-axis angle adjustment area. Scroll forward: the angle increases; scroll backward: the angle decreases. The bounding box in the view rotates around the X-axis, with the angle adjustment range of -360° to 360°. Click the up/down icons on the right: the up icon increases the angle, and the down icon decreases the angle, with the bounding box rotating around the X-axis. Enter an angle value directly in the input box on the right of the X-axis: the bounding box rotates around the X-axis accordingly. The same applies to the Y and Z axes.

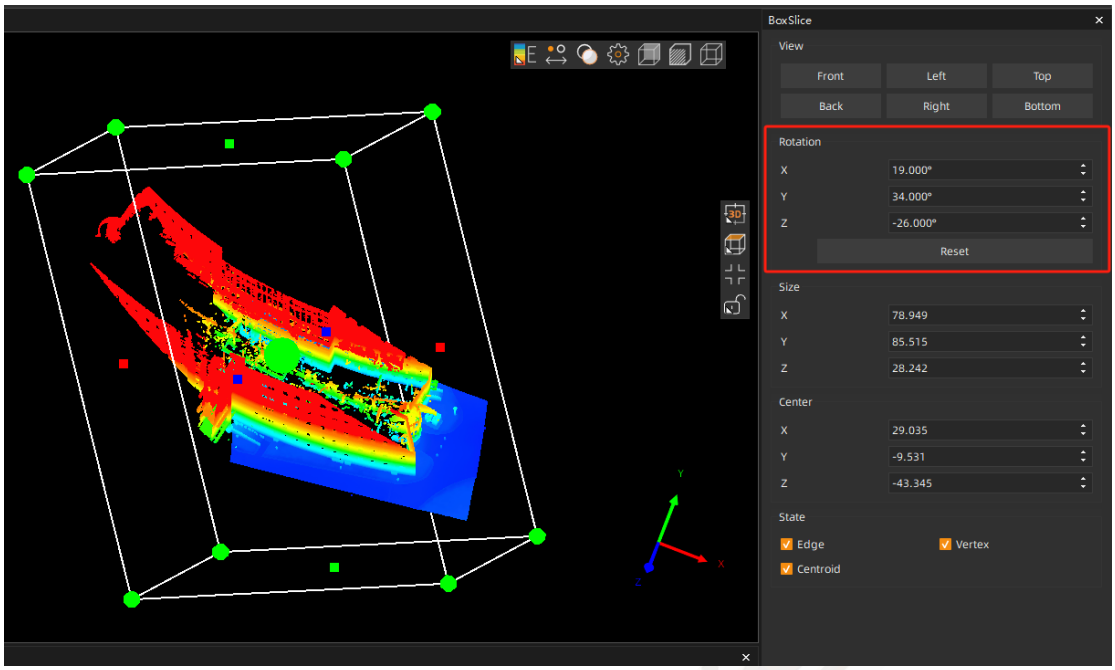


Figure: Effect of Modifying XYZ Rotation Angles

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

⑤ When the bounding box is adjusted in the view, the XYZ (length, width, height) dimensions in the bounding box settings panel are updated in real time. Modify th e XYZ (length, width, height) values of the bounding box dimensions: the length, width, and height of the bounding box in the view are updated accordingly. The u pdated bounding box is used to clip the point cloud in real time, with only the p oint cloud inside the bounding box retained and the point cloud outside not displa yed. Modify the XYZ values directly in the input boxes or by scrolling the mous e.

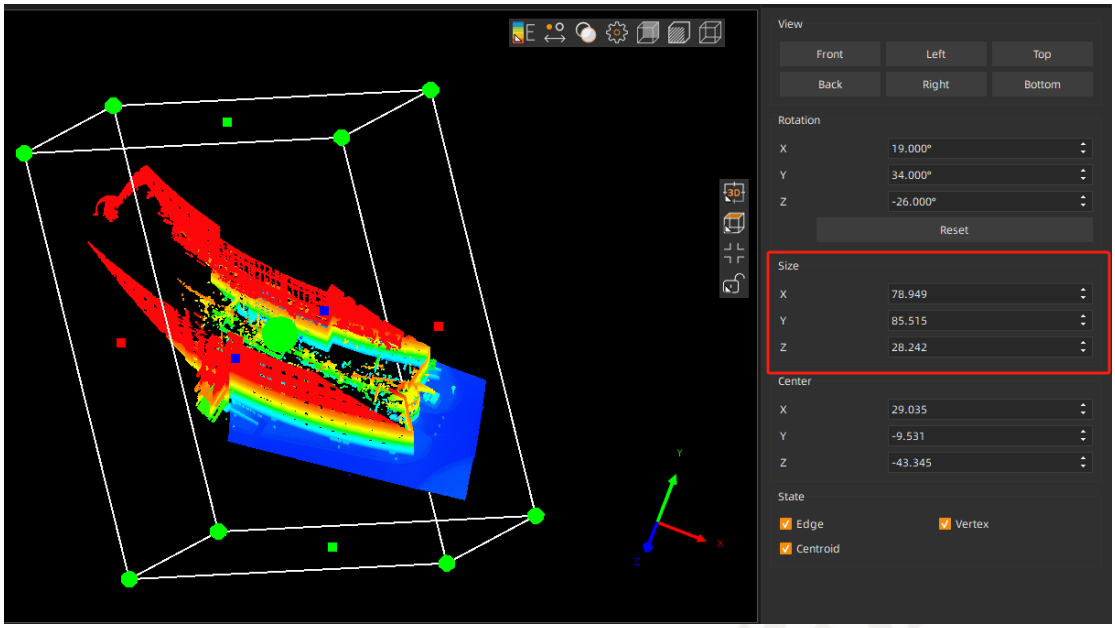


Figure: Effect of Modifying XYZ Dimensions

⑥ When the center point of the bounding box is dragged in the view, the XYZ coordinates of the center point in the bounding box settings panel are updated in real time. Modify the XYZ coordinate values of the center point: the bounding box in the view is translated according to the center point coordinates. The position and size of the point cloud remain unchanged; the bounding box is used to clip the point cloud, with only the point cloud inside the bounding box retained and the point cloud outside not displayed. Modify the XYZ values by entering them directly or scrolling the mouse over the center point area.

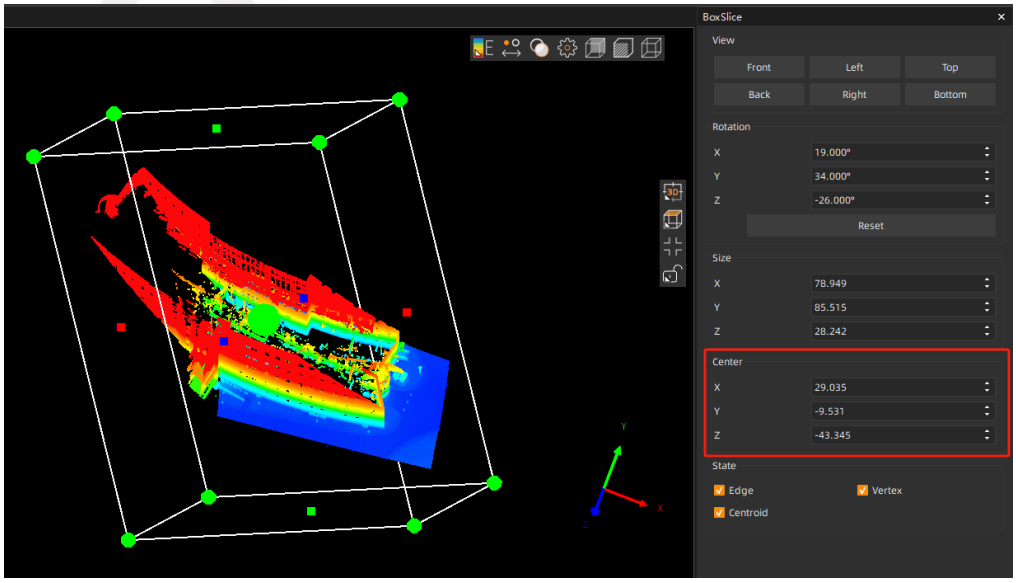


Figure: Effect of Modifying XYZ Coordinates of Center Point

⑦ Check "Edge" to display the bounding box frame in the view; uncheck it to hide the frame. The same applies to "Vertex" and "Centroid".

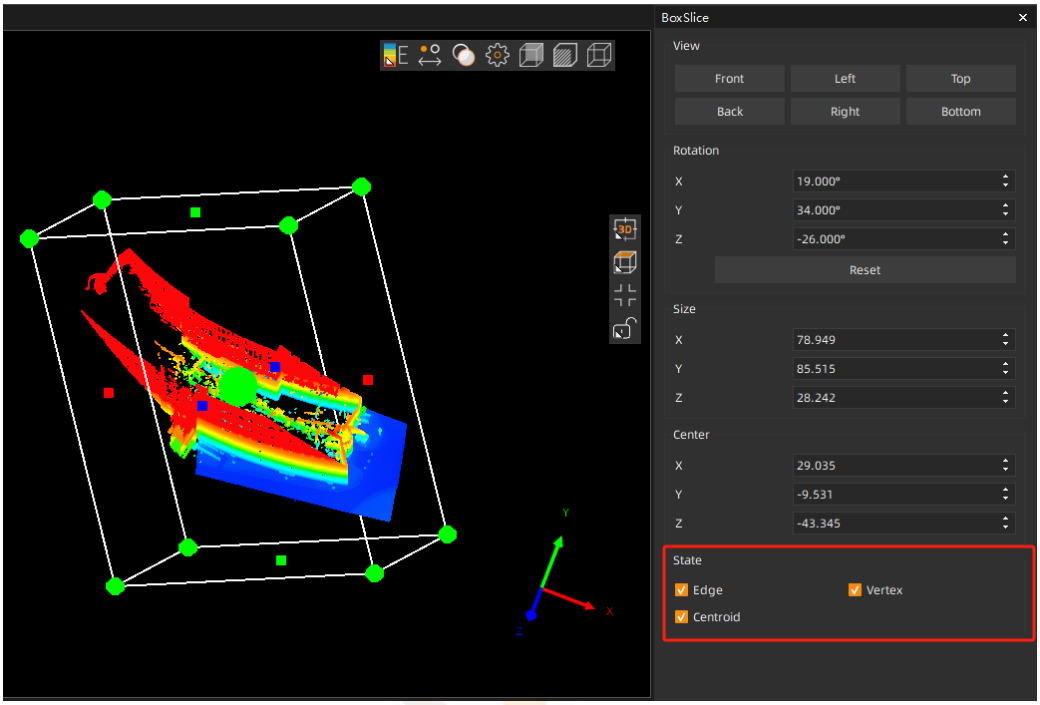


Figure: Effect of Hiding Frame, Vertex, Centroid

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

2.3.4.5 Switch

Function Description:

Switches between normal view and slice view. Highlighting indicates that the slice view is displayed.

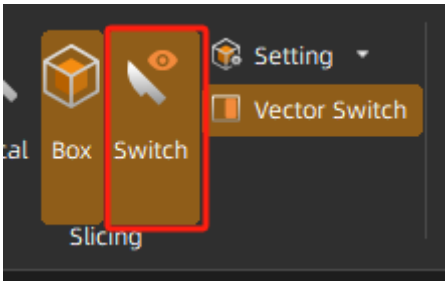


Figure: Switch Function Button

Operation Steps:

① Load point cloud and vector data for slicing. The button will be highlighted after slicing is completed.

② Click Base -> Slicing -> Switch to cancel the button highlight and switch to normal view.

③ Click Base -> Slicing -> Switch again to highlight the button and switch back to slice view.

2.3.4.6 Vector Switch

Function Description:

Controls whether vector data is clipped during slicing. By default, the button is not highlighted, indicating that vector data is not clipped.

Operation Steps:

① Load point cloud and vector data.

② Click Base -> Slicing -> Vector Switch to highlight the button.

③ Click Base -> Slicing -> Horizontal to enter horizontal slicing. Left-click to select a point on the point cloud to create a new horizontal slice. At this time, vector data will also be clipped.

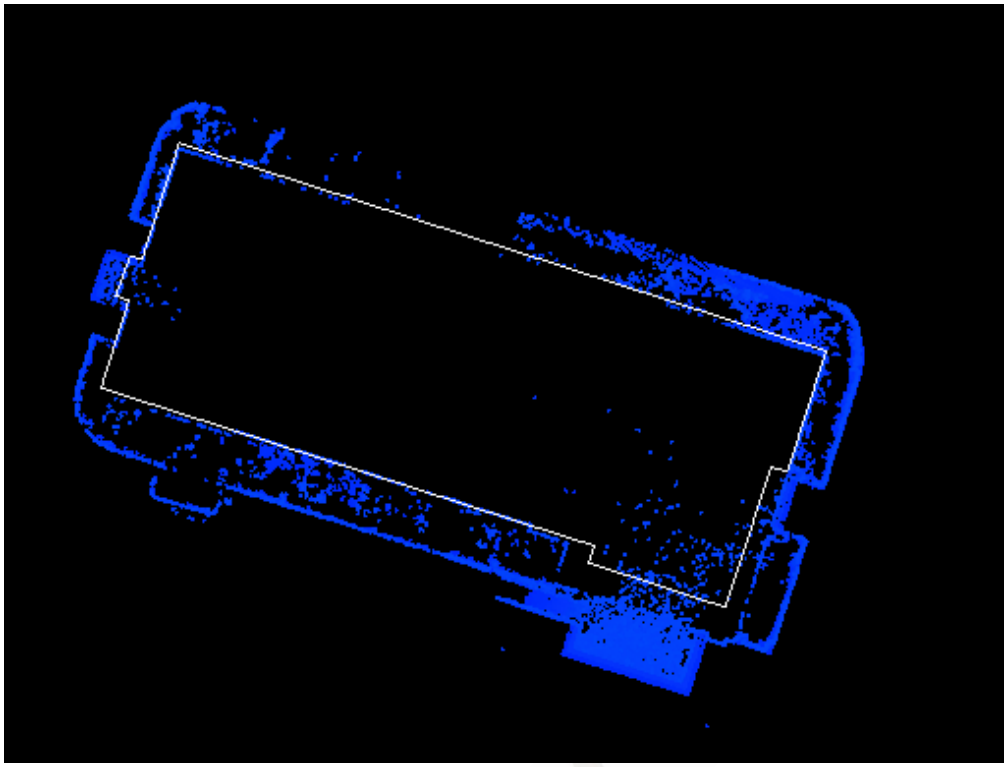


Figure: Horizontal Slice Without Clipping Vectors

④ Click Base -> Slicing -> Vector Switch to unhighlight the button.

⑤ Click Base -> Slicing -> Horizontal to enter horizontal slicing. Left-click to select a point on the point cloud to create a new horizontal slice. At this time, vector data will not be clipped. The same applies to vertical slicing and bounding box slicing.

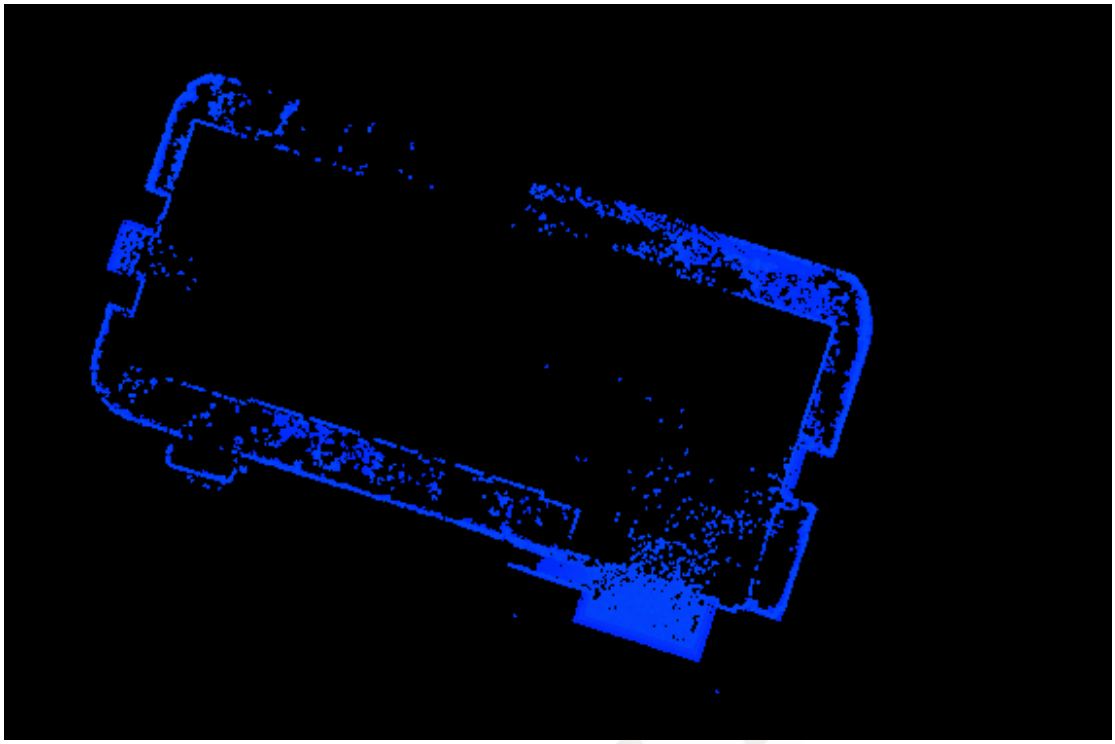


Figure: Horizontal Slice With Clipping Vectors

2.3.5 Save

Function Description:

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

Operation Steps:

① Load the point cloud, click to activate the "Rectangle/Polygon/Lasso/Vector selection" drawing function, and draw a clipping area in the view.

② Select "Inner Clipping/Outer Clipping" to obtain the clipping result.

③ Click Horizontal/Vertical/Bounding Box to slice based on the clipping result and obtain the slicing result.

④ Click Base -> Save -> Clip/Slice to pop up the save interface. Select the point cloud file to be clipped and saved, set the parameters, and click OK.

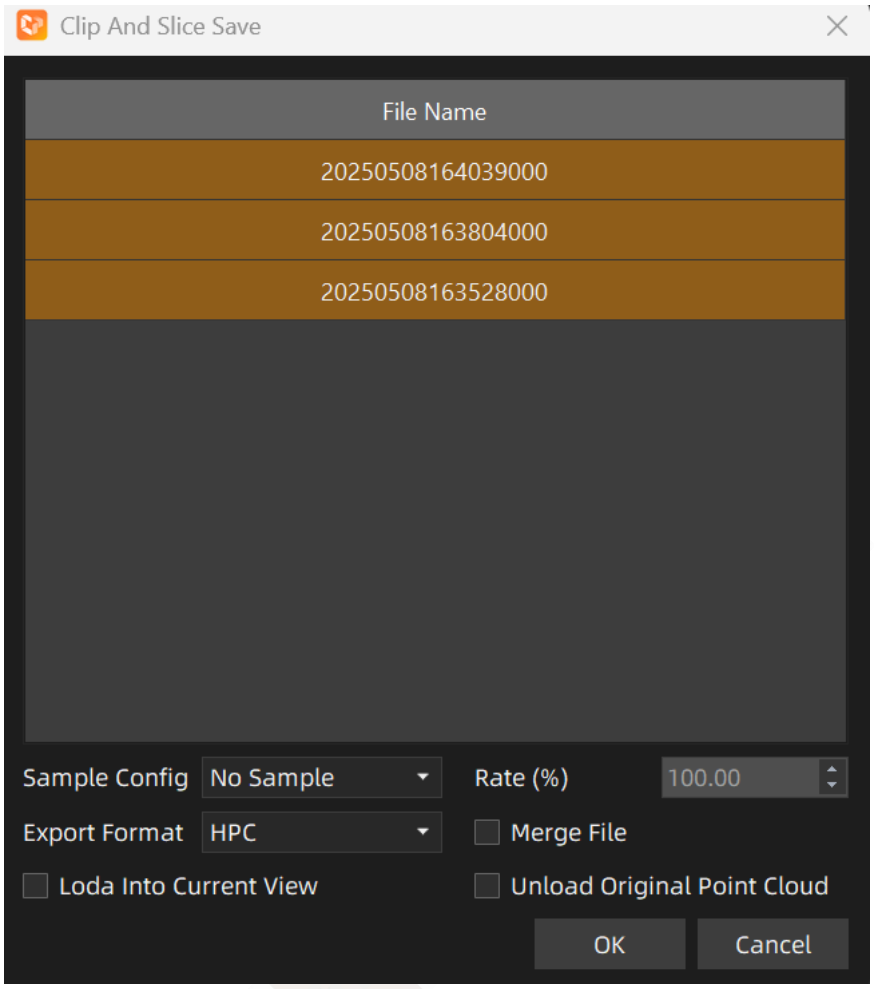


Figure: Save Clipped Slice

⑤ In the pop-up dialog box, select the file save directory and enter a file name to save there. If there is only one point cloud file, a folder selection dialog box will pop up. After selecting the folder, the clipped point cloud will be directly saved to the selected folder path. File naming rule: Time_OriginalPointCloudName.

Parameter Settings

Sampling Settings: Three sampling methods are available: "Random Sampling, Grid Sampling, No Sampling".

Sampling Rate (%): Default is 10%, with a range of 0.01-99.99%. Sampling is performed according to the set sampling rate; the smaller the sampling rate, the fewer points are retained.

Grid Side Length (m): Sampling is performed according to the grid side length. At most one point is retained in each grid. The default side length is 0.1m. A smaller gr id side length results in slower thinning and more retained points; a larger grid side l ength results in faster thinning and fewer retained points.

Save Format: Supports exporting clipped point clouds in las or hpc format.
Load into Current View: If checked, the saved point cloud will be automatically load ed into the current view.

Unload Original Point Cloud: If checked, the selected point cloud file will be autom atically unloaded after successful saving.

Merge File: If more than one point cloud is involved in clipping, check this option t o merge the clipped point clouds into a single file.

2.3.6 Check

2.3.6.1 Precision

Function Description:

Supports automatic elevation matching and manual point-picking planar matching for p oint clouds, automatically calculates indicators such as planar/elevation root mean squa re error (RMSE) and maximum deviation of point clouds, generates statistical reports, and accurately locates error distributions.

Operation Steps:

① Click Base-> Check -> precision to open the precision check interface.

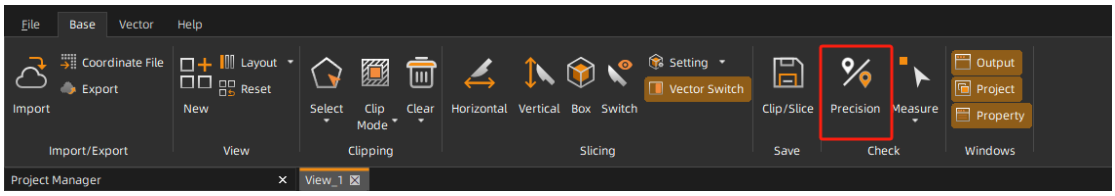


Figure: Precision

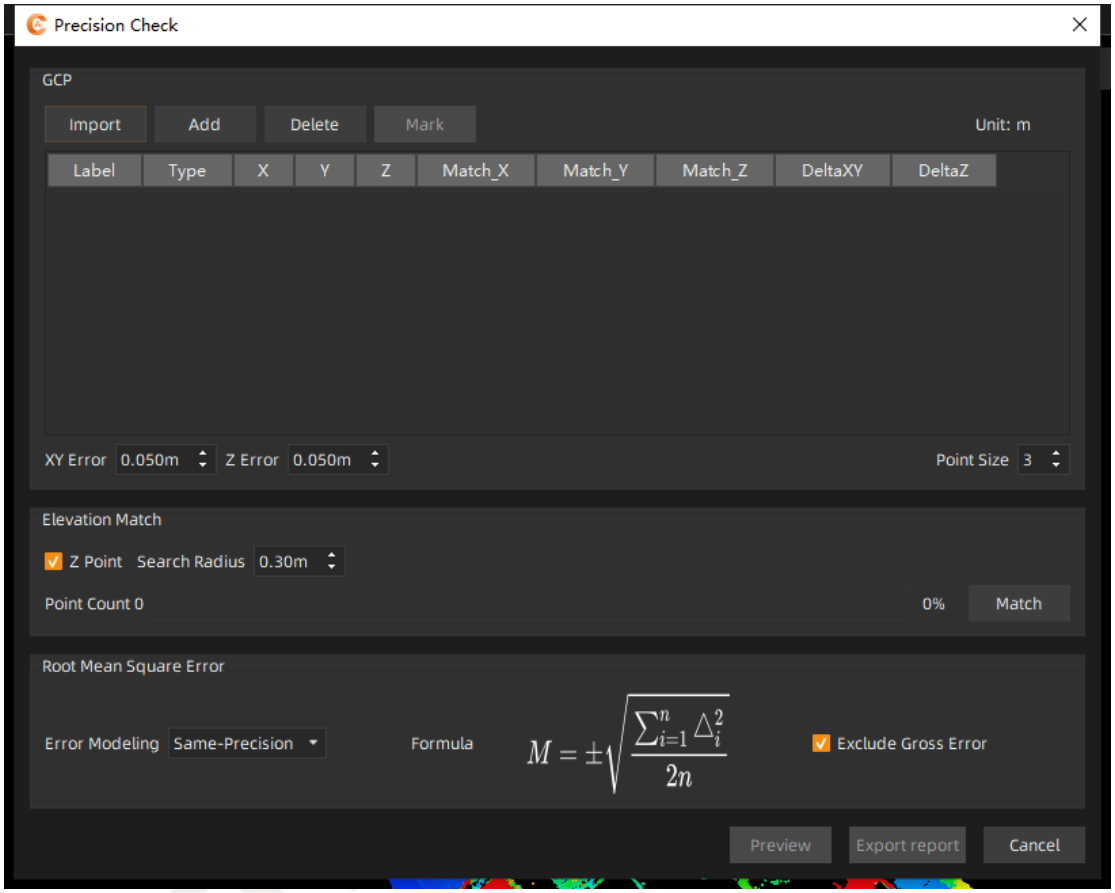


Figure: Precision Check Interface

② Click "Import", select a coordinate file (supports .dat, .txt, .csv formats). After opening, adjust the corresponding columns with the import coordinate file, then click OK to import the coordinate data.

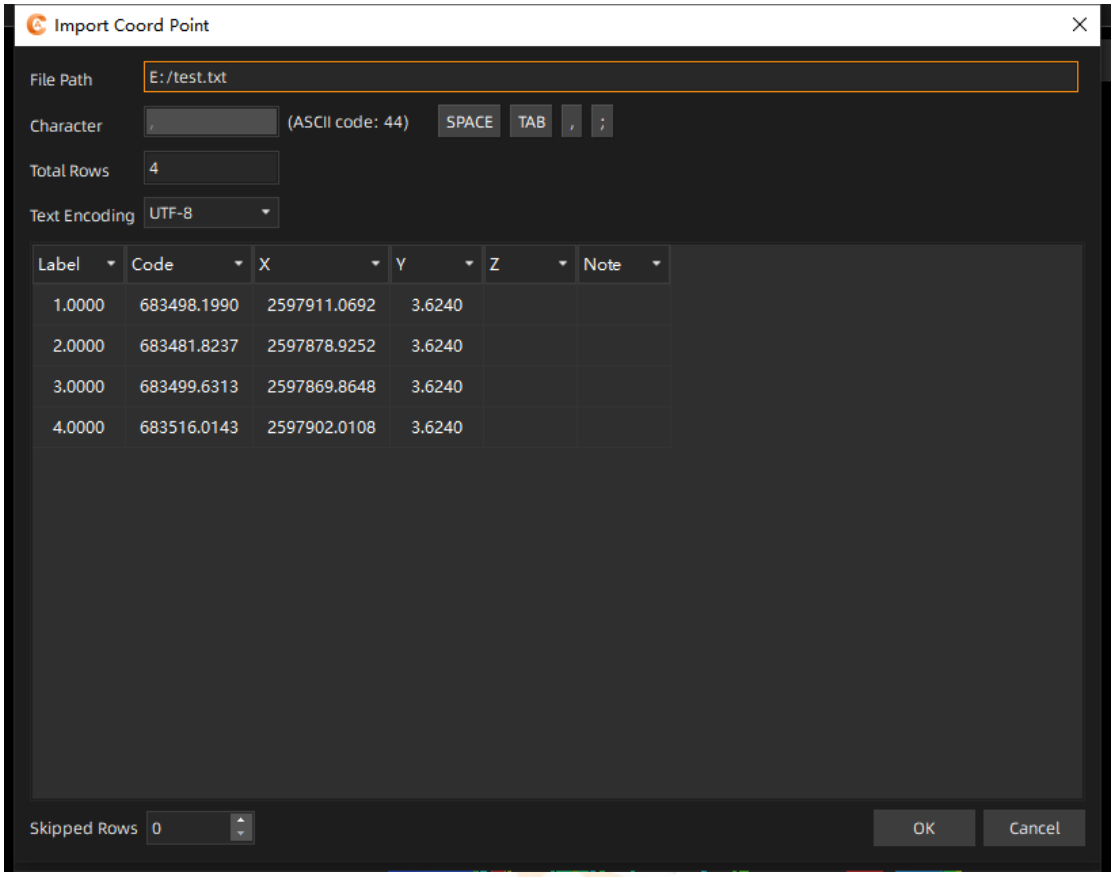


Figure: Precision Coordinate Import

③ Click the "Add" button to add a blank row to the list. Double-click to manually enter known points.

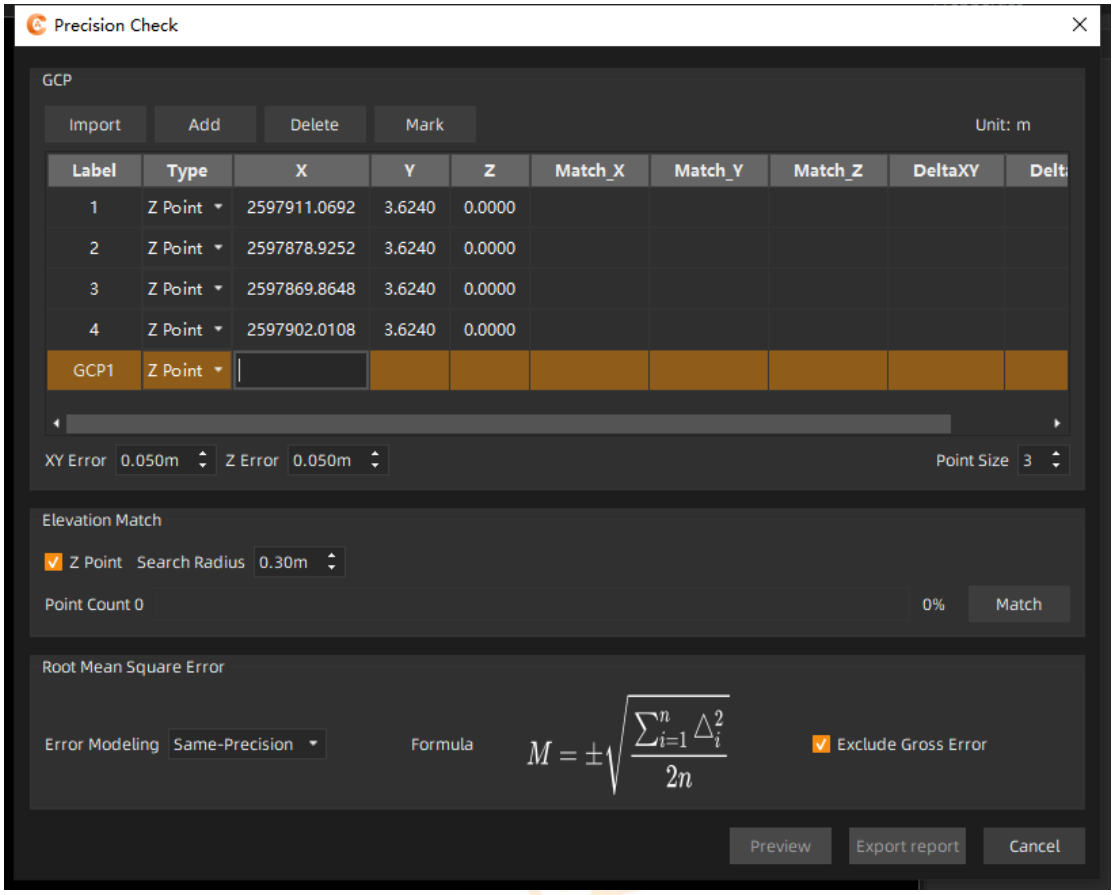


Figure: Manually Enter Known Points

④ After successful data import or manual entry of known points, positioning labels f or existing points will appear in the view. Meanwhile, in the coordinate data list, you can modify the point name, type, X, Y, Z, Match_X, Match_Y, and Match_Z values by double-clicking to select.

Figure: Label

⑤ Coordinate points are divided into three types: Z points, XY points, and 3D point s.

- Z points: Only perform elevation precision check.
- XY points: Only perform planar precision check.
- 3D points: Perform both elevation and planar precision check.

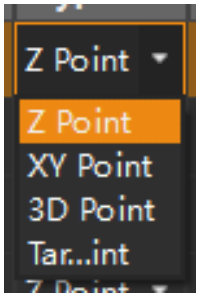


Figure: Point Types

⑥ The "Planar RMSE Limit" and "Elevation RMSE Limit" input boxes below the co ordinate list can be used to set error limits.

⑦ In the automatic matching section of the precision check, check the elevation poin t option, set the neighborhood radius, and click the "Match" button to perform ele vation matching for all elevation points. After matching, the automatic matching se ction of the precision check displays the number of successfully matched points. T he DeltaZ value of points within the elevation limit has no background color; the DeltaZ value of points outside the elevation limit but within twice the elevation li mit has an orange background; the DeltaZ value of points outside twice the elevat ion limit has a red background.

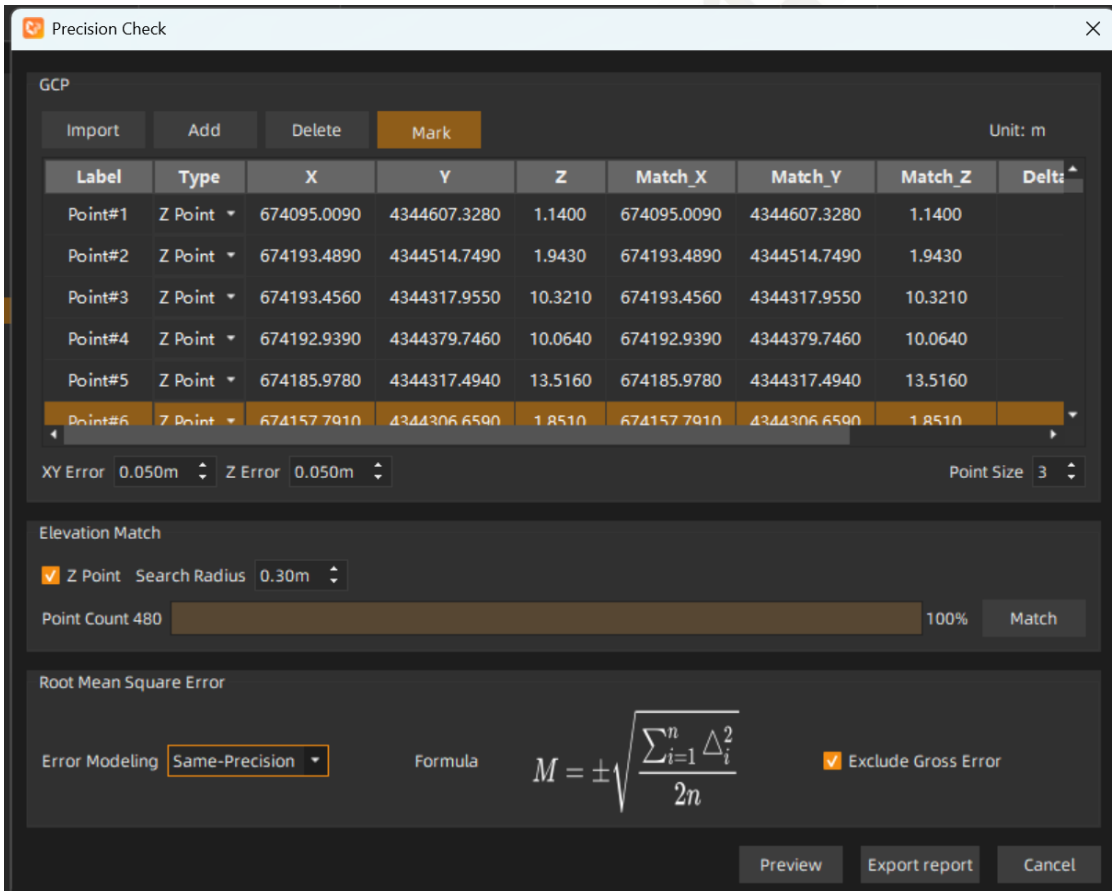


Figure: Within Limit

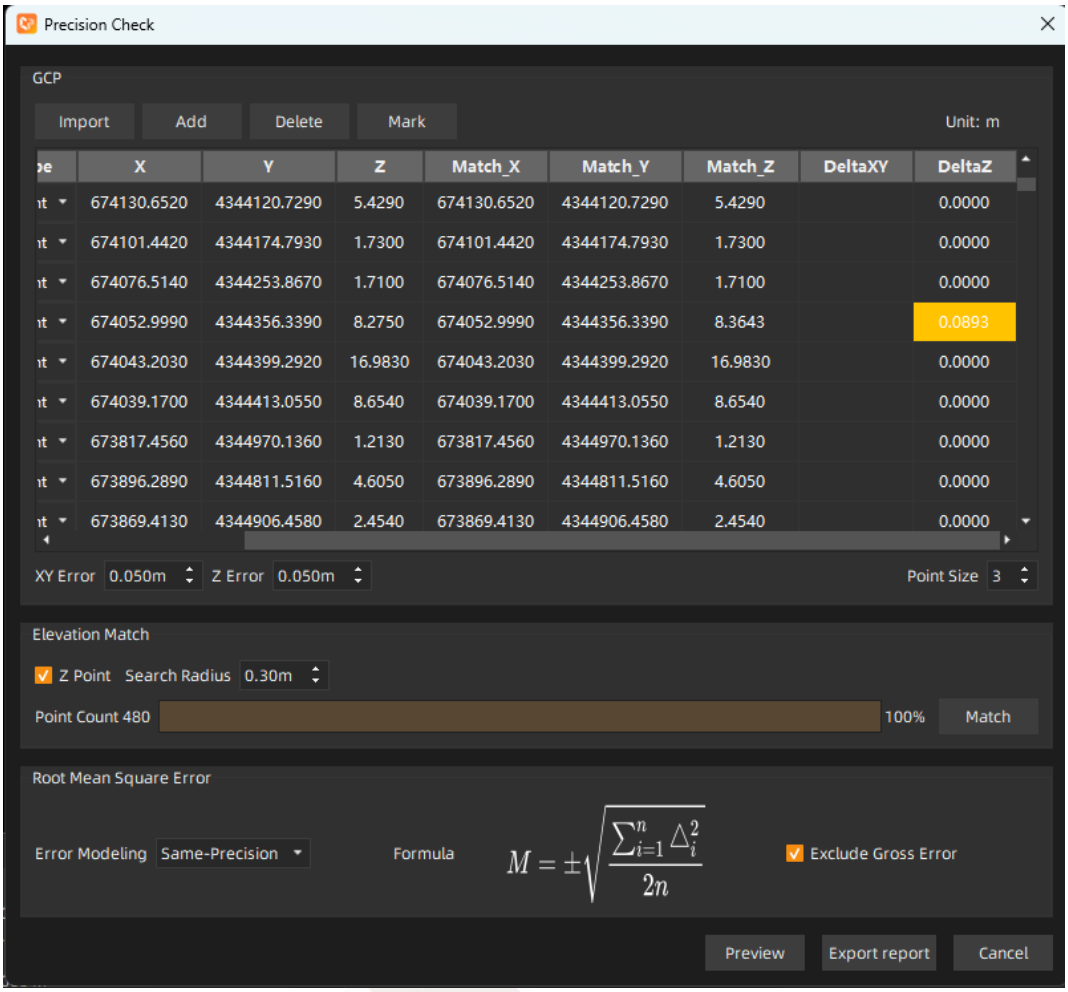


Figure: Outside Limit, Within Twice the Limit

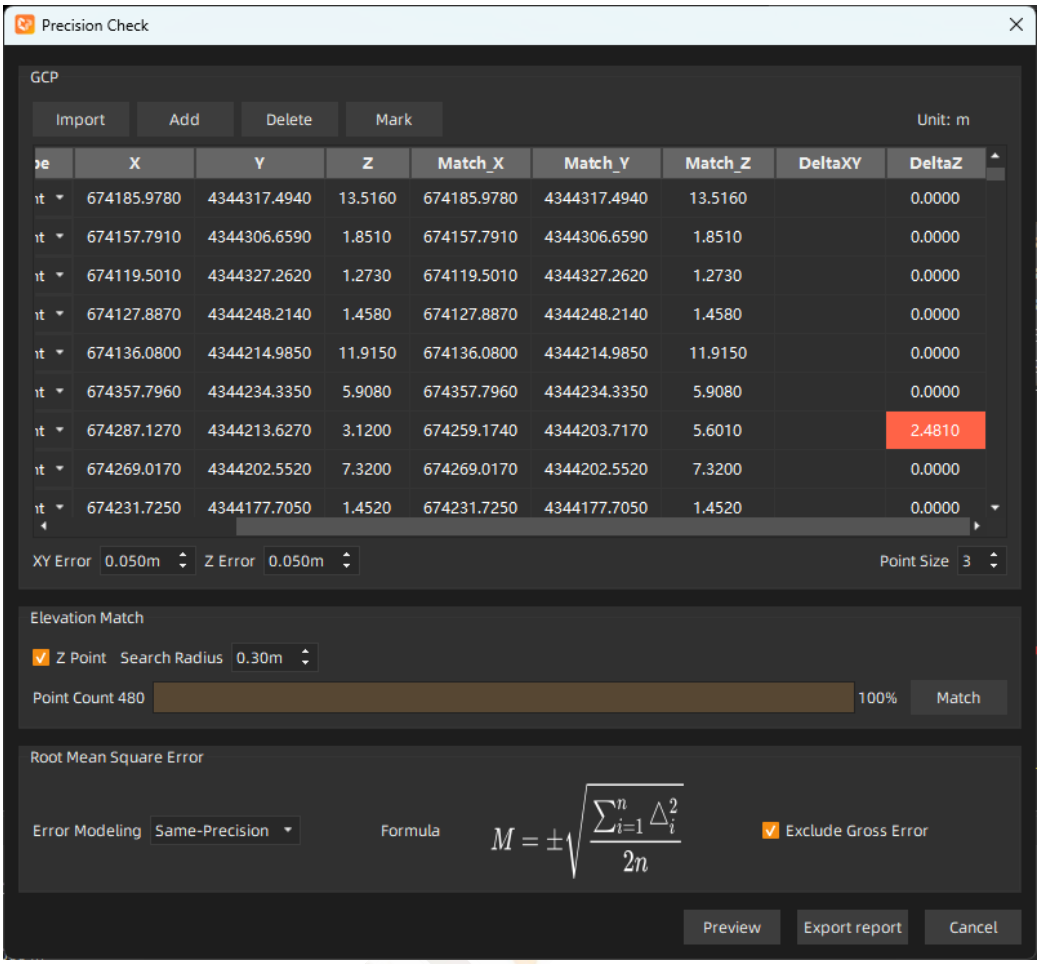


Figure: Outside Twice the Limit

⑧ In the RMSE section, you can modify the RMSE calculation method and choose whether to eliminate gross errors. There are three error calculation methods: same-precision, high-precision, and mean-precision check.

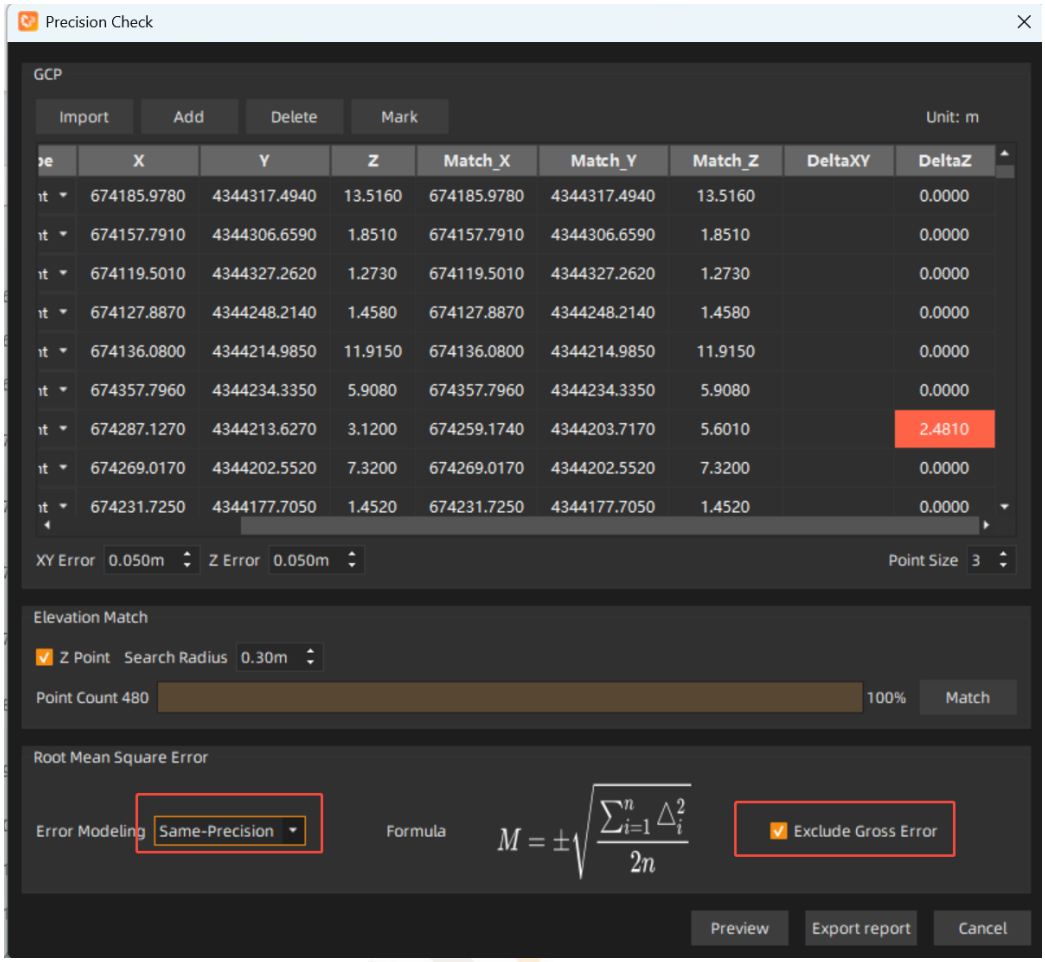


Figure: RMSE

⑨ After precision checking, you can export and preview the report. Click the "Previe w" button to pop up the precision check report; click "Export Report" to export a report with PDF format.

2.3.6.2 Measure

This section introduces measurement functions, including point measurement, length me asurement, area measurement, angle measurement, and density measurement.

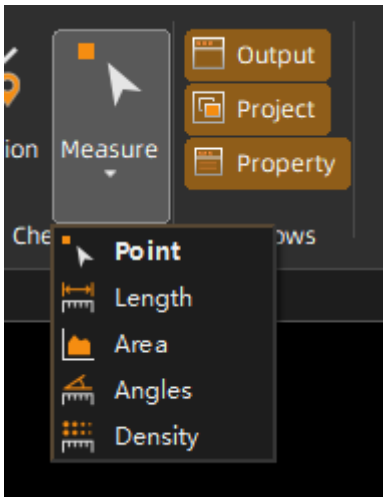


Figure: Measure Buttons

2.3.6.2.1 Point

Function Description:

Left-click to select a point on the point cloud in the view window to query information such as coordinates, intensity, time, and classification of the point. If no point cloud is captured, only the coordinates of the blank point are displayed.

Operation Steps:

① Click Base -> Measure -> Point to enter point measurement mode.

② Left-click a point on the point cloud in the view window. An information box will display XYZ coordinates, intensity, time, classification, RGB color, etc., which will also be displayed in the output window.

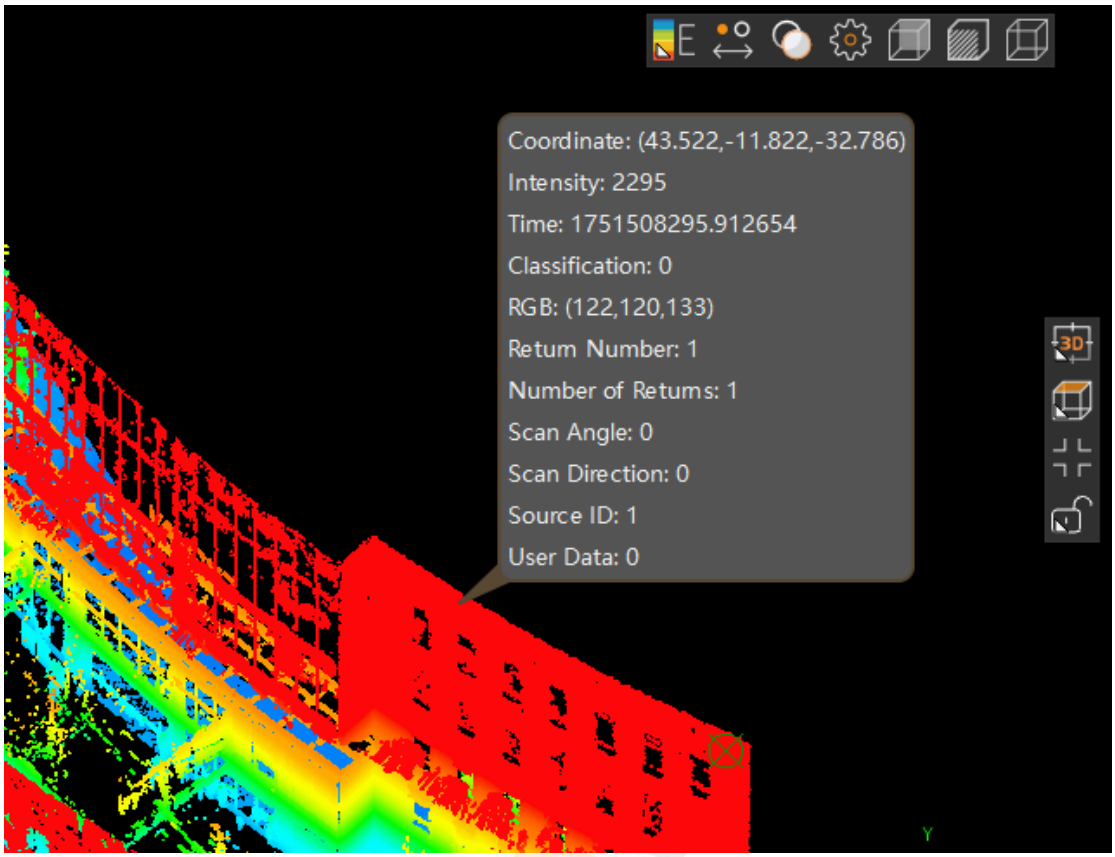


Figure: Point Measurement

③ Left-click a blank area in the view window or loaded vector, DEM, image, or mo del data. If no point cloud is captured, only the coordinates of the blank point are displayed.

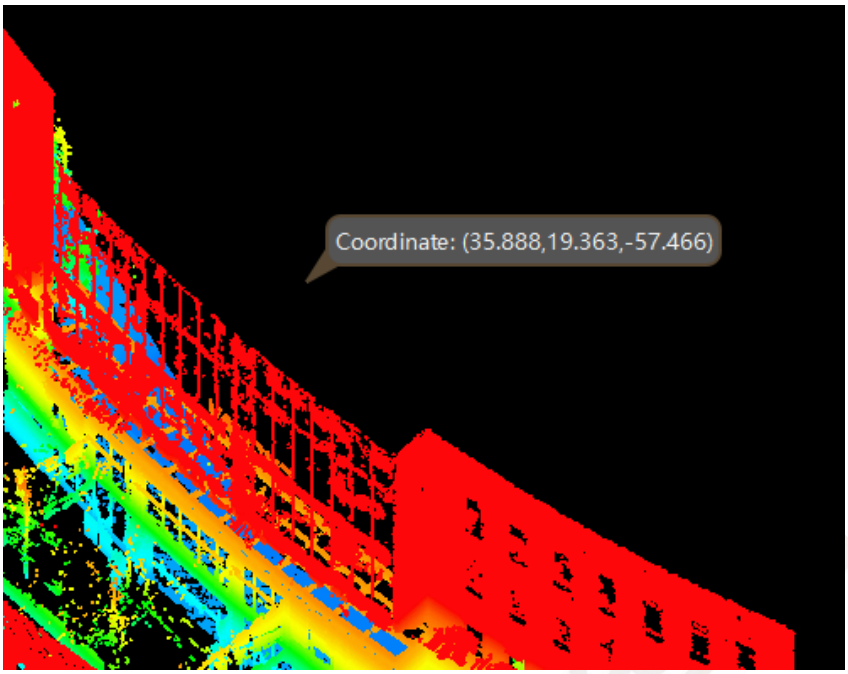


Figure: Point Measurement

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 Base -> Measure -> Length to enter length measurement mode.

② Left-click sequentially to select multiple points in the view window. The information box displays the 2D length, 3D length of the polyline between points, and the distance differences in XYZ directions between the current point and the previous point.

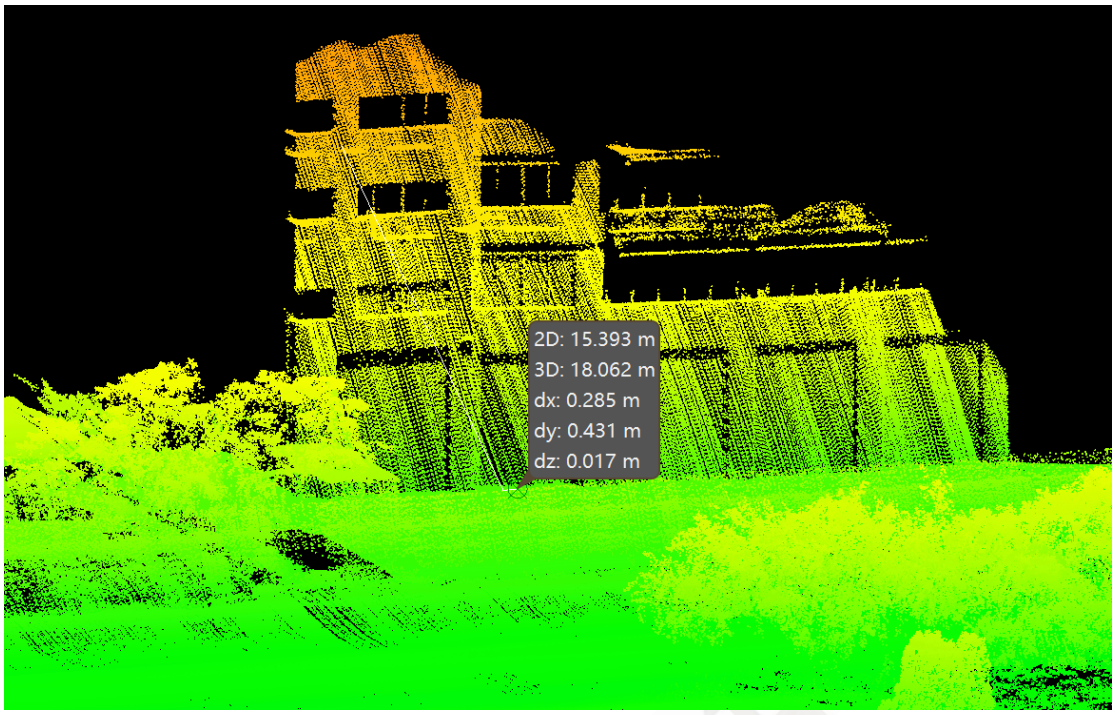


Figure: Length Measurement

2.3.6.2.3 Area

Function Description:

The area measurement function calculates the projected area by drawing a polygon.

Operation Steps:

① Click Base -> Measure -> Area to enter area measurement mode.

② Left-click to select the corner points of the polygon. The enclosed area will be displayed in real time.

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 the polyline by selecting three points to draw a polyline.

Operation Steps:

① Click Base -> Measure -> Angle to enter angle measurement mode.

② Left-click to select three points to draw a polyline. 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:

Obtains point density by calculating the average number of points per square meter. Point density can be used as an important indicator to evaluate the quality of point cloud data.

Operation Steps:

① Click Base -> Measure -> Density to enter the point density measurement command.

② By default, it calculates and displays the point density per square meter. You can also enter the length of the square manually, then left-click a point to calculate the point density within the selected range.

③ Click the close button in the upper right corner of the point density to end and exit the point density measurement command.

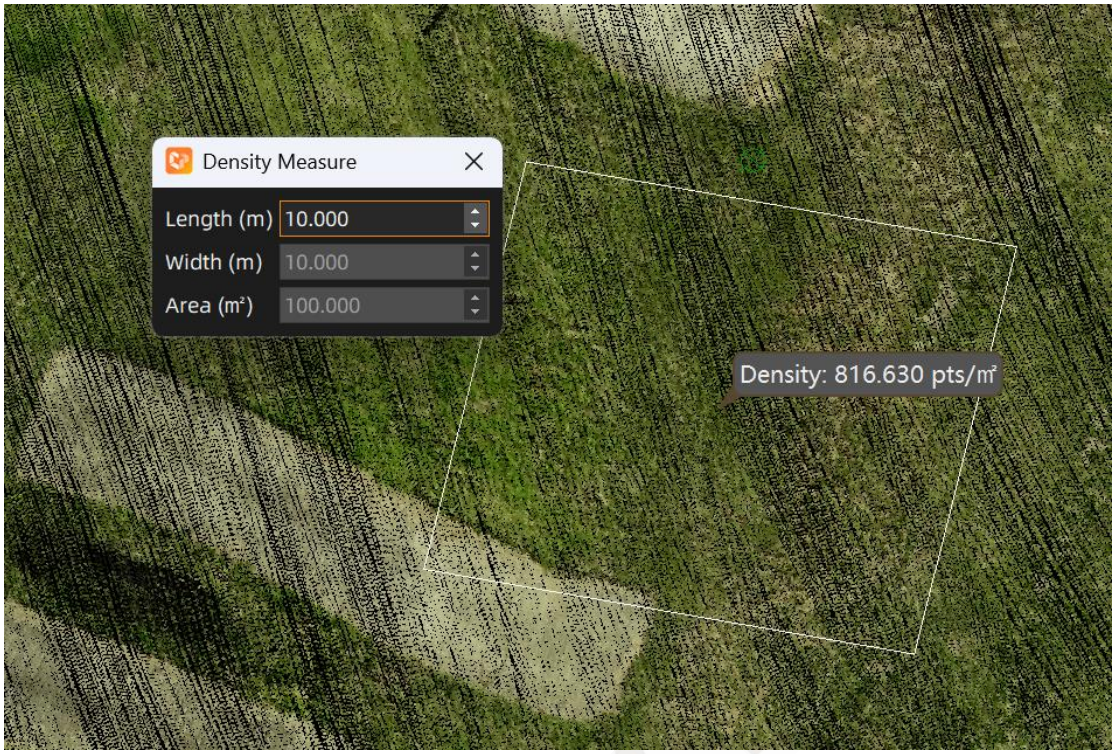


Figure: Density Measurement

2.3.7 Window

This section mainly introduces window display. Users can freely choose which windo ws to show or hide.

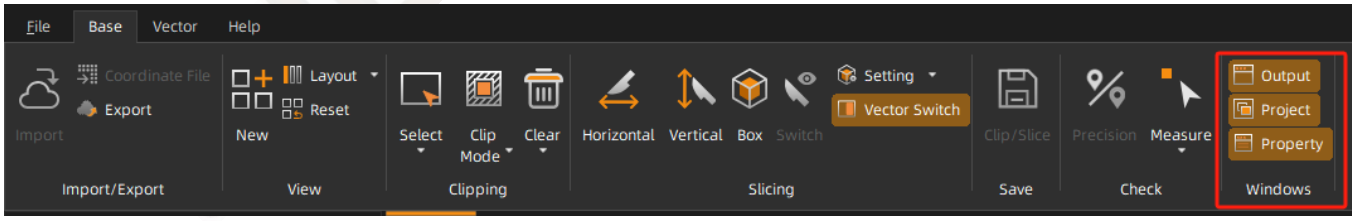


Figure: Window Display

2.3.7.1 Output Window

Function Description:

Displays key operation steps and processing results during operations. Click Base -> Windows to show or hide the output window.

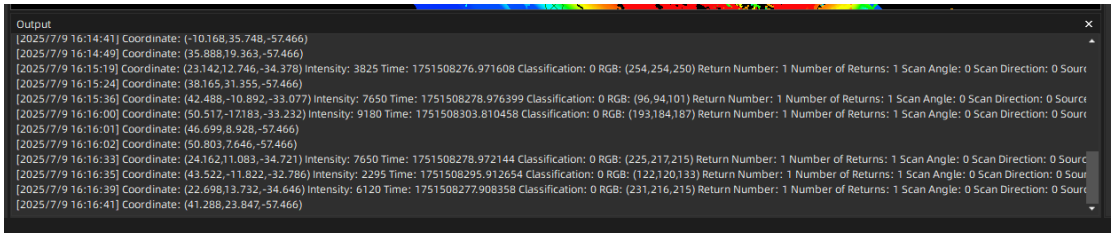


Figure: Output Window

Operation Steps:

① The output window is highlighted and loaded by default.

② Click Base -> Windows to unhighlight the output window and hide it. Click again to highlight the output window button and display the window.

2.3.7.1.1 Single Selection/Multiple Selection

Function Description:

Allows selecting information in the output window to highlight it.

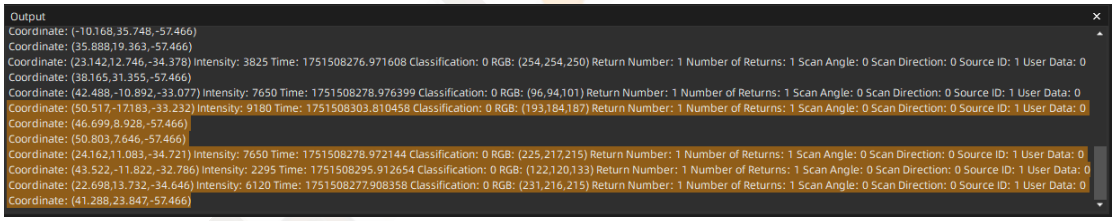


Figure: Selecting Information in Output Window

Operation Steps:

① Left-click once in the output window to select a row of information, which will be highlighted.

② Left-click once in the output window to select a row of information, then hold the left mouse button and drag up or down to select multiple rows of information in the output window, which will be highlighted.

③ Left-click once in the output window to select a row of information, then press the Shift key and select the last row of information to select multiple rows of infor

mation in the output window, which will be highlighted.

2.3.7.1.2 Copy

Function Description:

Copies selected information in the output window to the clipboard.

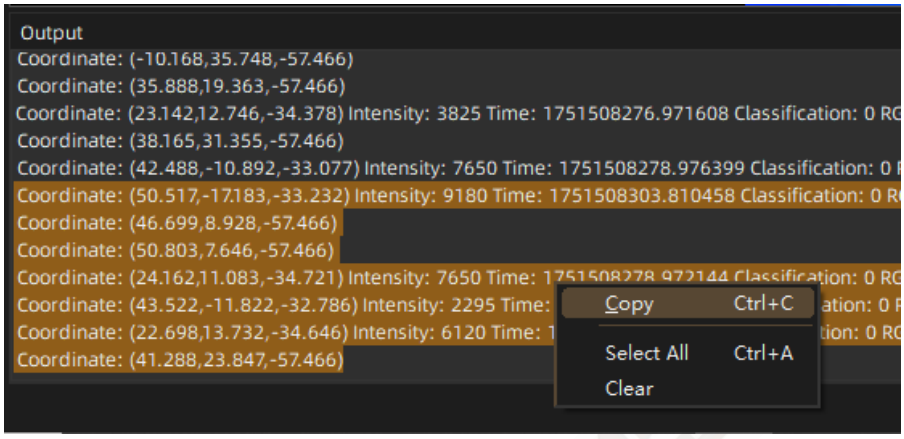


Figure: Copying Information in Output Window

Operation Steps:

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

2.3.7.1.3 Select All

Function Description:

Selects all information in the output window, which will be fully highlighted.

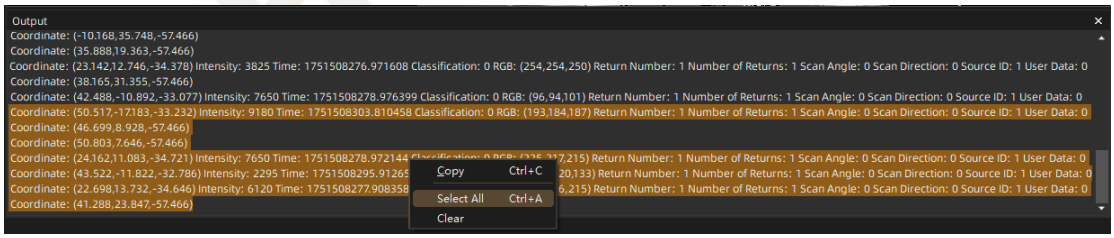


Figure: Selecting All Information in Output Window

Operation Steps:

Right-click in the output window to bring up the menu, select "Select All" or use the shortcut key Ctrl+A. The selected information will be highlighted.

2.3.7.1.4 Clear

Function Description:

Clears all information in the output window.

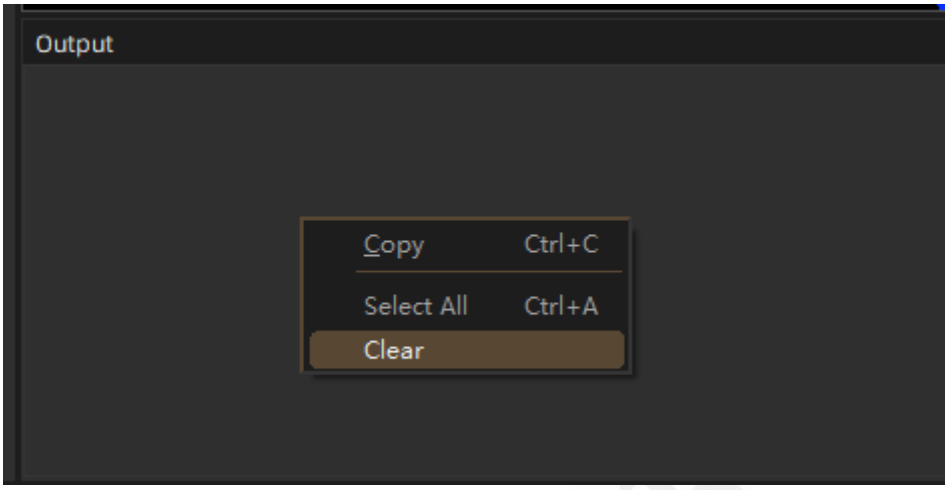


Figure: Clearing Information in Output Window

Operation Steps:

Right-click in the output window to bring up the menu, select "Clear" to clear all information in the output window.

2.3.7.2 Project Management

Function Description:

Click Base -> Project to show or hide the project management panel.

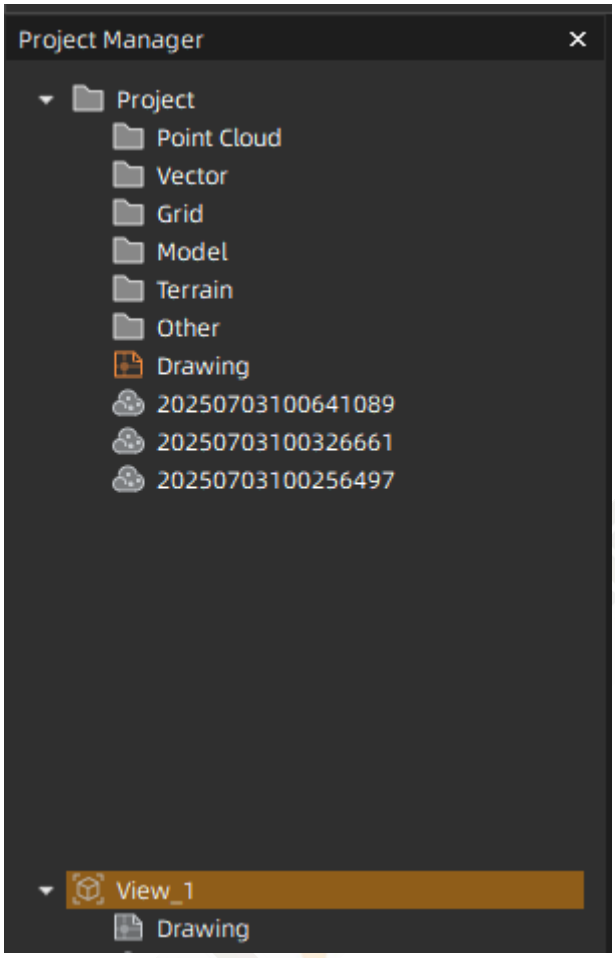


Figure: Project Management

Operation Steps:

① The project management panel is highlighted and loaded by default.

② Click Base-> Project to unhighlight the panel and hide it. Click again to highlight the project management button and display the panel.

2.3.7.2.1 Data Management Panel

Function Description:

The data management panel can manage vector, point cloud, DEM, image, OSGB, and other data.

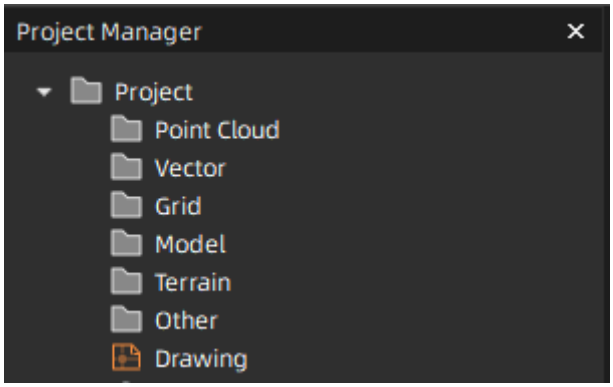


Figure: Data Management Panel

2.3.7.2.1.1 Open Vector

Function Description:

Loads vectors in dxf or dwg format.

Operation Steps:

① Project node -> Right-click Vector node, bring up the menu, and left-click "Open Vector" as shown in the figure.

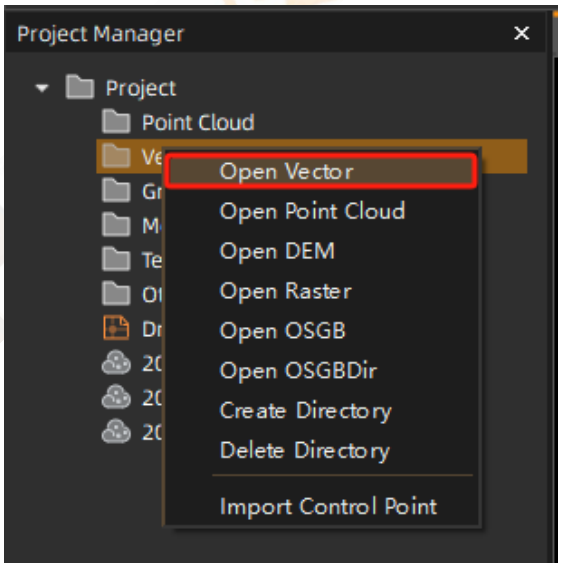


Figure: Right-Click to Open Vector in Folder

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. Meanw hile, the vector data is mounted under the vector folder node, and it is in an inac

tive state by default (the icon on the left of the vector data is not highlighted).

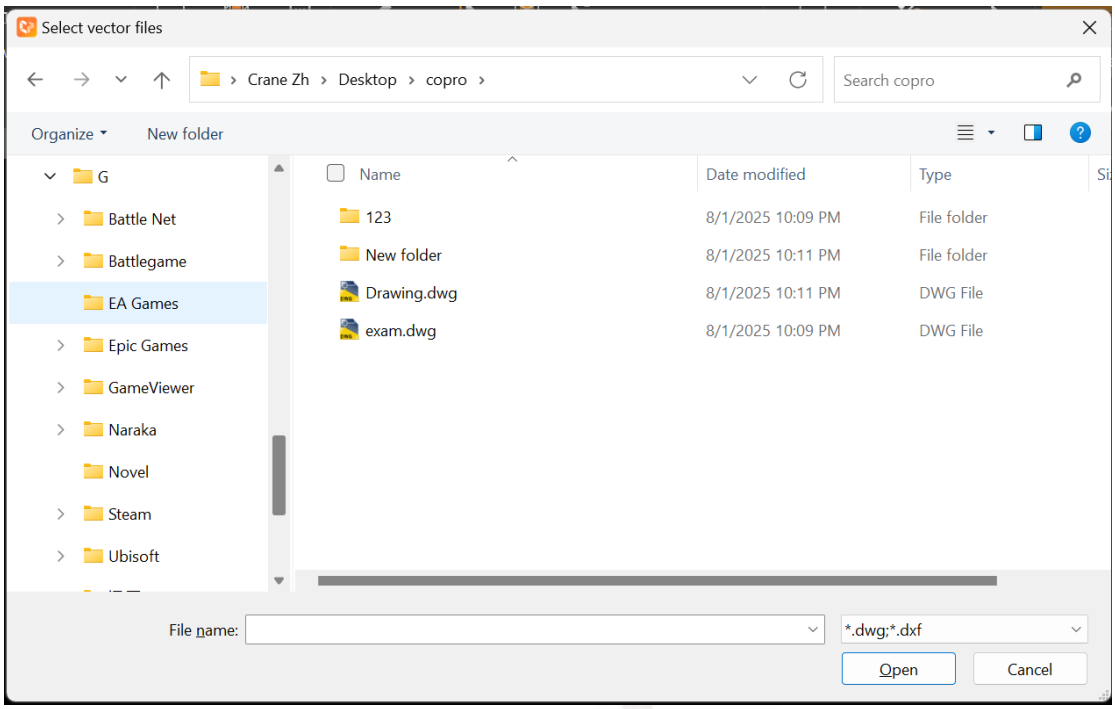


Figure: Vector Selection Dialog Box

2.3.7.2.1.2 Open Point Cloud

Function Description:

Loads point clouds in las, codata, laz, or hpc format.

Operation Steps:

① Project node -> Right-click point cloud node, select and left-click "Open Point Cloud" in the menu as shown in the figure.

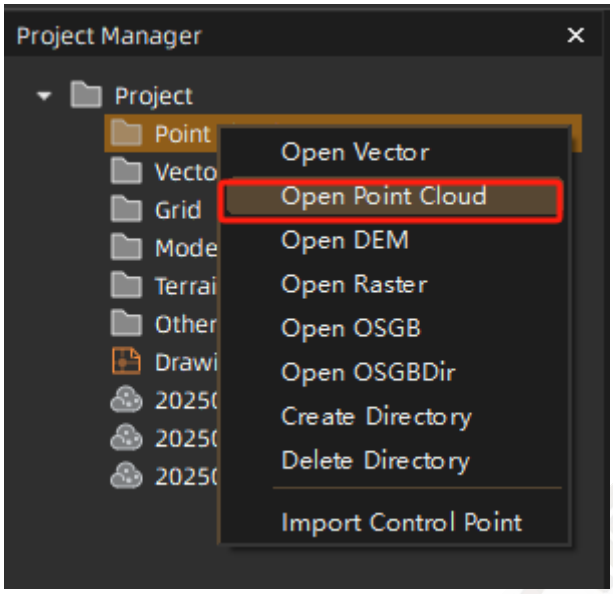


Figure: Project Management to Open Point Cloud

② Select point cloud data in las, codata, laz, or hpc format to load the point cloud into the view. The imported data is mounted under the point cloud node.

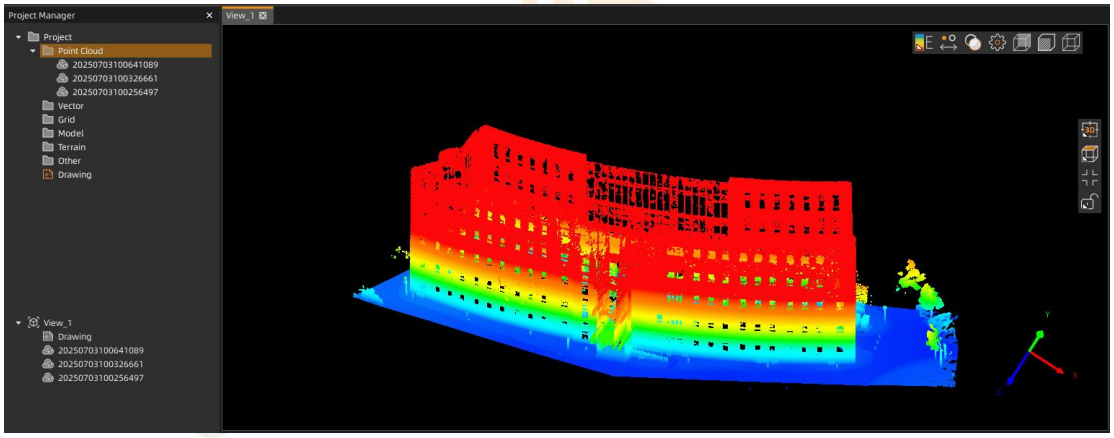


Figure: Loading Point Cloud Data

2.3.7.2.1.3 Open DEM

Function Description:

Loads DEM data in tif or tiff format via project management.

Operation Steps:

① Project node -> Right-click Grid node, select and left-click "Open DEM" in the menu as shown in the figure.

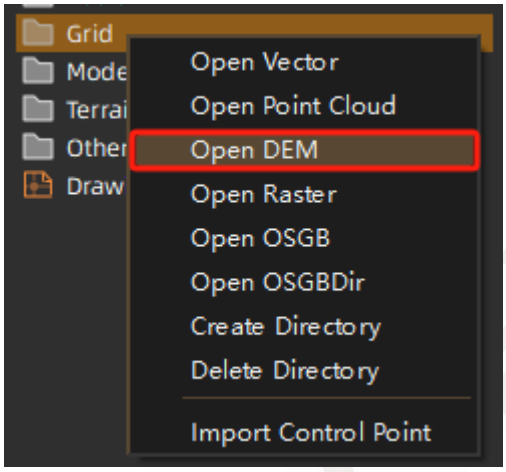


Figure: Open DEM

② Select DEM data in tif or tiff format to load the DEM into the view. The imported data is mounted under the grid node.

2.3.7.2.1.4 Open Image

Function Description:

Loads image data in formats such as tif or jpg via project management.

Operation Steps:

① Project node -> Right-click grid node, select and left-click "Open Raster" in the menu as shown in the figure.

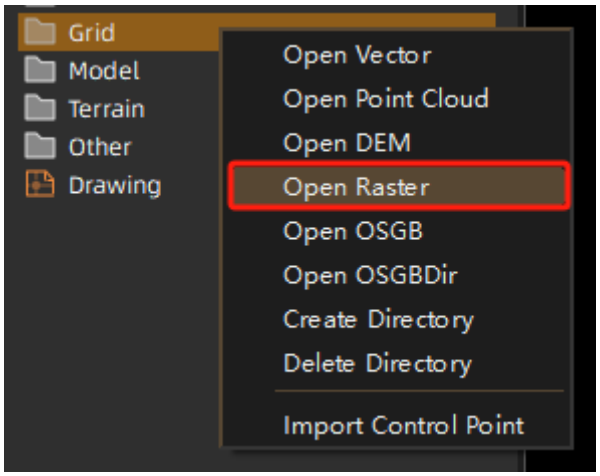


Figure: Open Image

② Select image data in tif or jpg format to load the image into the view. The imported data is mounted under the grid node.

2.3.7.2.1.5 Open OSGB Model

Function Description:

Loads model data in osgb format via project management.

Operation Steps:

① Project node -> Right-click Model node, select and left-click "Open OSGB" in the menu as shown in the figure.

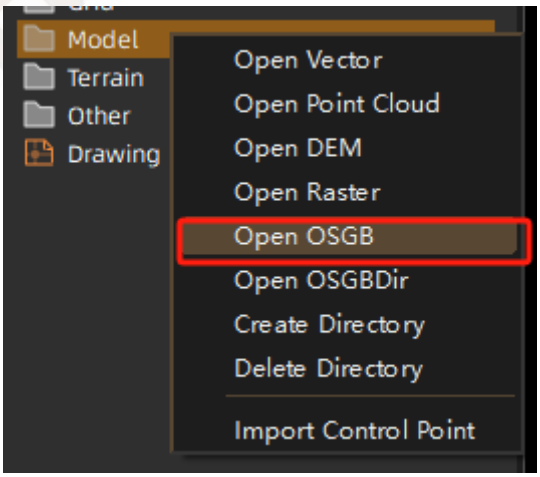


Figure: Open OSGB Model

② Select data in osgb format to load the OSGB model data into the view.

2.3.7.2.1.6 Open OSGB Folder

Function Description:

Loads OSGB model folder data in osgb format via project management.

Operation Steps:

① Project node -> Right-click Model node, select and left-click "Open OSGB Dir" in the menu as shown in the figure.

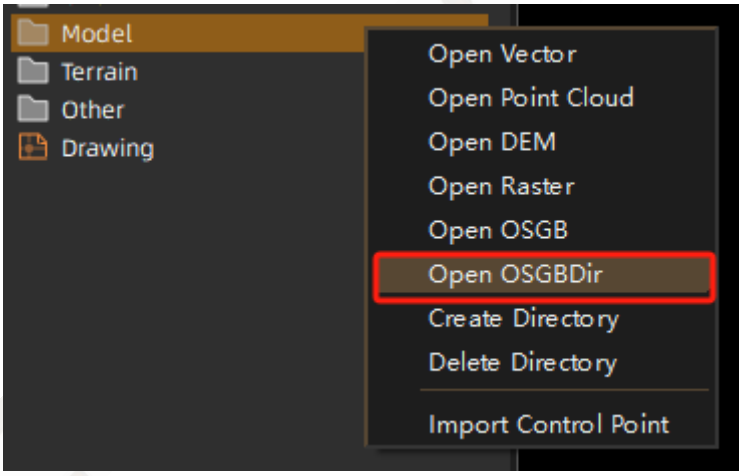


Figure: Open OSGB Folder

② Select data in osgb format to load the OSGB model data into the view.

2.3.7.2.1.7 Create New Folder

Function Description:

Creates a new folder in project management.

Operation Steps:

① If you right-click an existing folder (Point Cloud/Vector/Grid/Model/Terrain/Other) and

select "Create Directory", the new folder will be created under the existing folder.

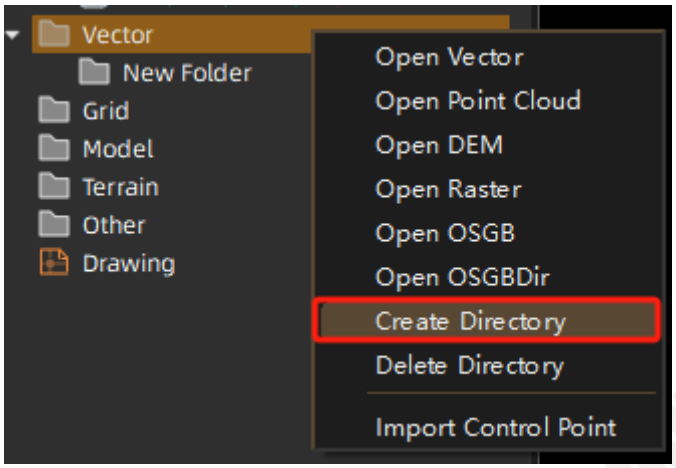


Figure: Create New Folder

② If you right-click a blank area in the data panel and select "Create Directory", the new folder will be created under the root node of the project, at the same level as existing folders.

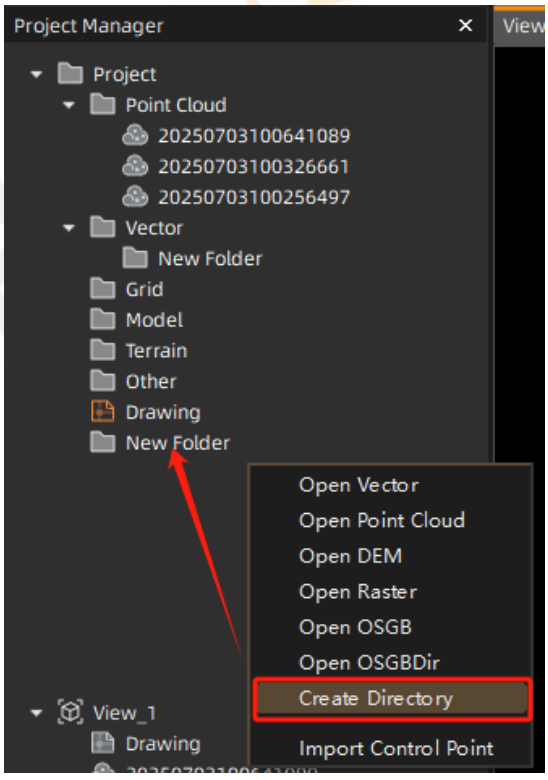


Figure: Create New First-Class Directory

2.3.7.2.1.8 Rename

Function Description:

Renames a folder.

Operation Steps:

Double-click the folder to be renamed. The current full name of the folder is selected by default. Enter the new name of the folder in the input box, then left-click or press Enter to confirm the modification.

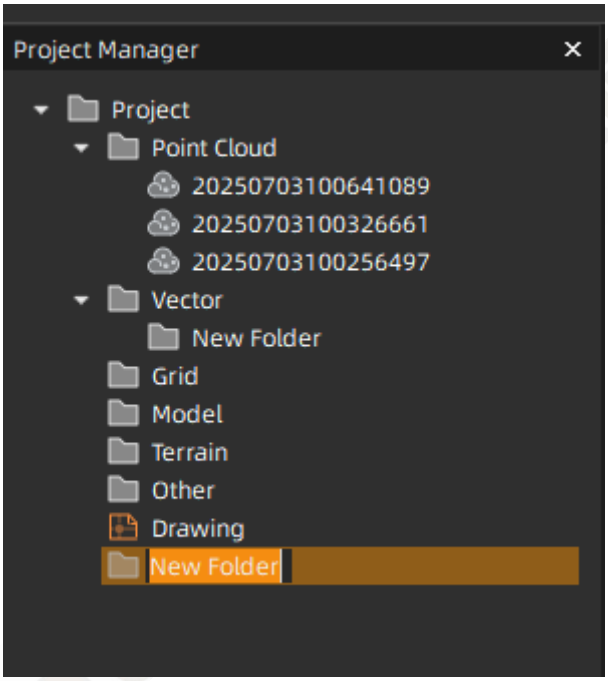


Figure: Rename

2.3.7.2.1.9 Delete Folder

Function Description:

Deletes a folder and the data in it from the project management node and the view.

Operation Steps:

Project node -> Folder (Point Cloud/Vector/Raster/Model/Panorama/Other), right-click any one and click "Delete Directory" to delete the folder. If the folder contains data, s

elect "Ok" in the pop-up prompt box to delete the folder and its data, and remove th e data from the view window.

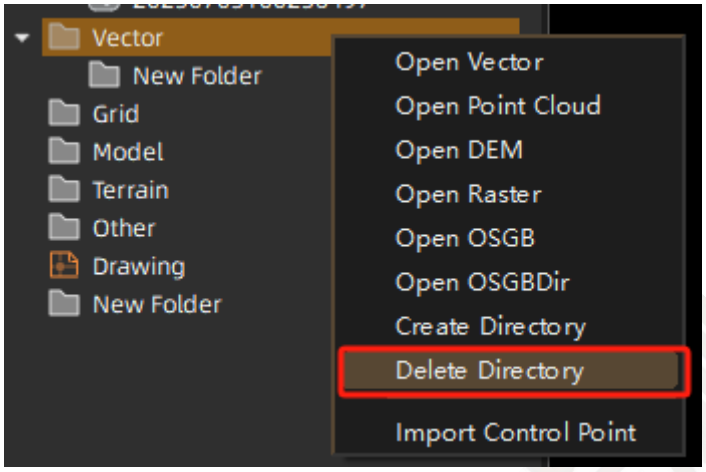


Figure: Delete Folder

2.3.7.2.1.10 Import Control Point

Function Description:

Loads Control Points in dat, csv, or txt format into the currently active drawing and displays it in the view.

Operation Steps:

① Project node -> Folder (right-click) -> Import Control Point, select a coordinate fil e in txt, dat, or csv format, click "Open". A coordinate file dialog box will appea r in the software interface.

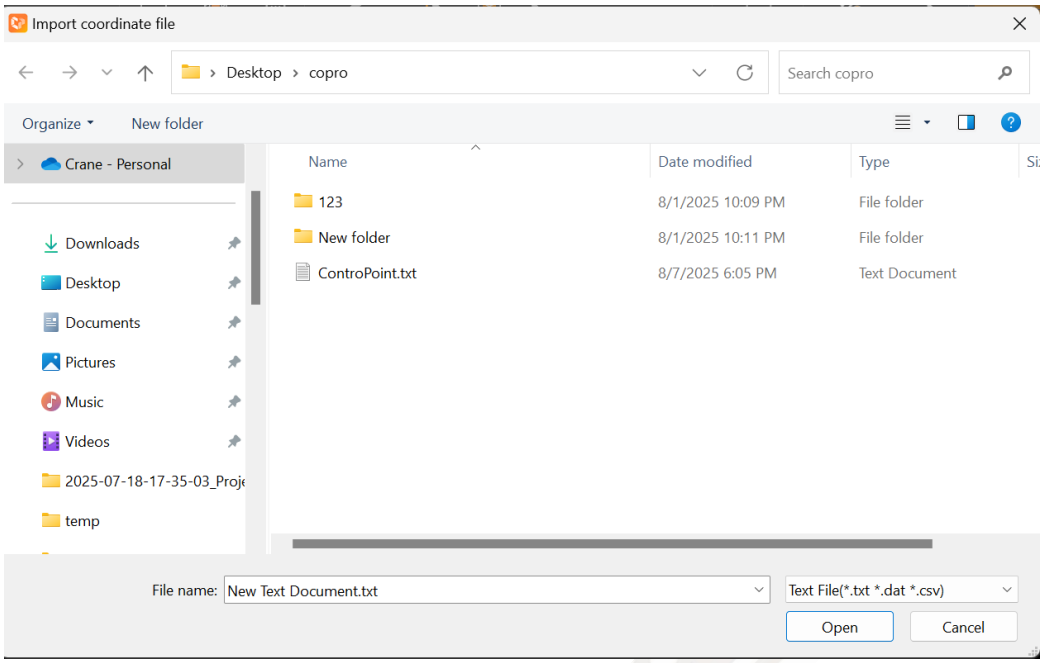


Figure: Open Coordinate File

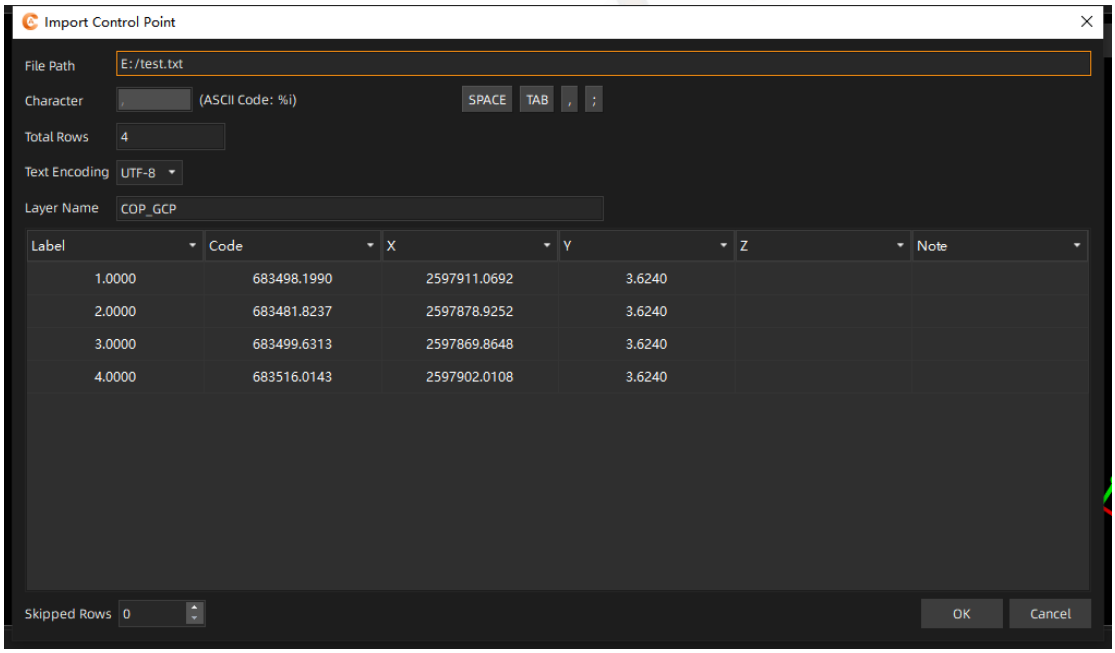


Figure: Import Coordinate File Dialog Box

② In the "Import Control Point" dialog box, make settings to ensure both X and Y columns exist and contain coordinate data. Click "OK" to import the coordinate file into the currently active drawing and display it in the view.

2.

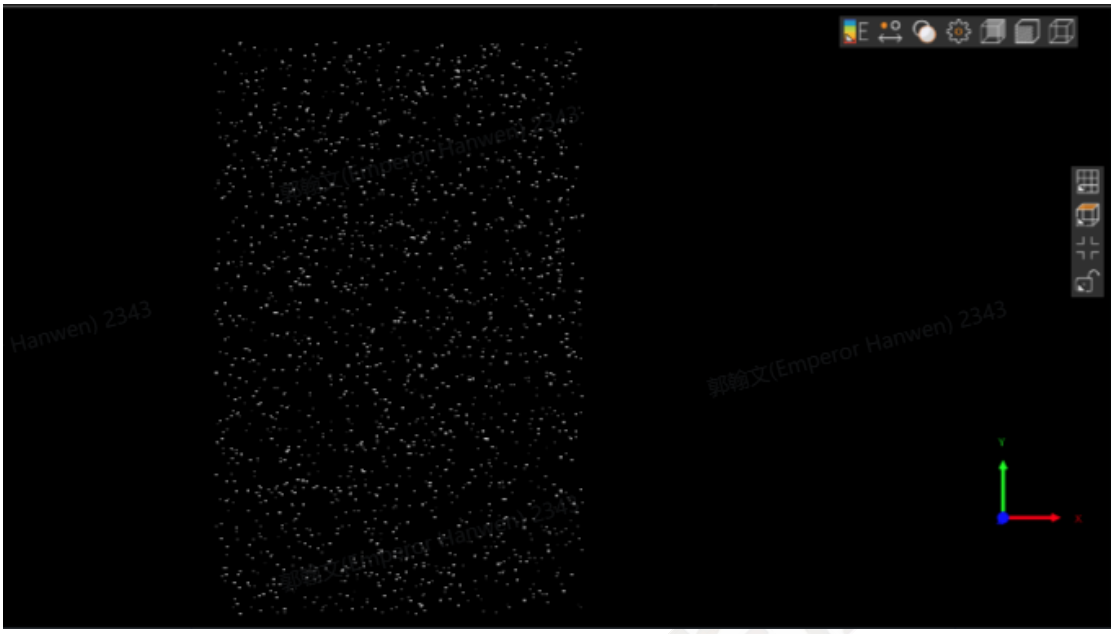


Figure: Coordinate File Display Effect

2.3.7.2.1.11 Right-Click Menu in Blank Area

Function Description:

Right-clicking in the blank area of project management allows loading vector, point cloud, DEM, image, OSGB, coordinate files, etc., and creating folders.

Operation Steps:

① Right-click a blank area in the data panel to pop up a menu. You can load vector, point cloud, DEM, image, OSGB models, or coordinate files, and create new folders in project management. The loaded data or new folders will be mounted at the bottom of the project tree.

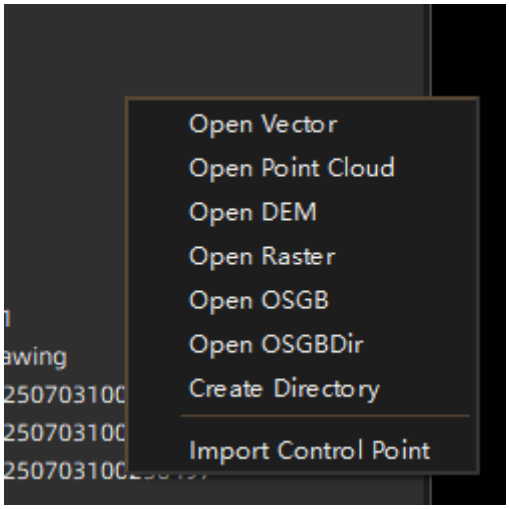


Figure: Right-Click Menu in Blank Area

2.3.7.2.1.12 Drag to Open Data

Function Description:

Drag point cloud, vector, DEM image, or OSGB data to the view window or project management panel to load it. When dragging las, codata, or laz point clouds, they wil l be directly converted to hpc format.

Operation Steps:

① Select one or more point cloud, vector, DEM image, OSGB model, or OSGB fold er data, hold the left mouse button, and drag the data into the view/data managem ent panel.

② Release the left mouse button to load and display the dragged data in the view w indow or data management panel.

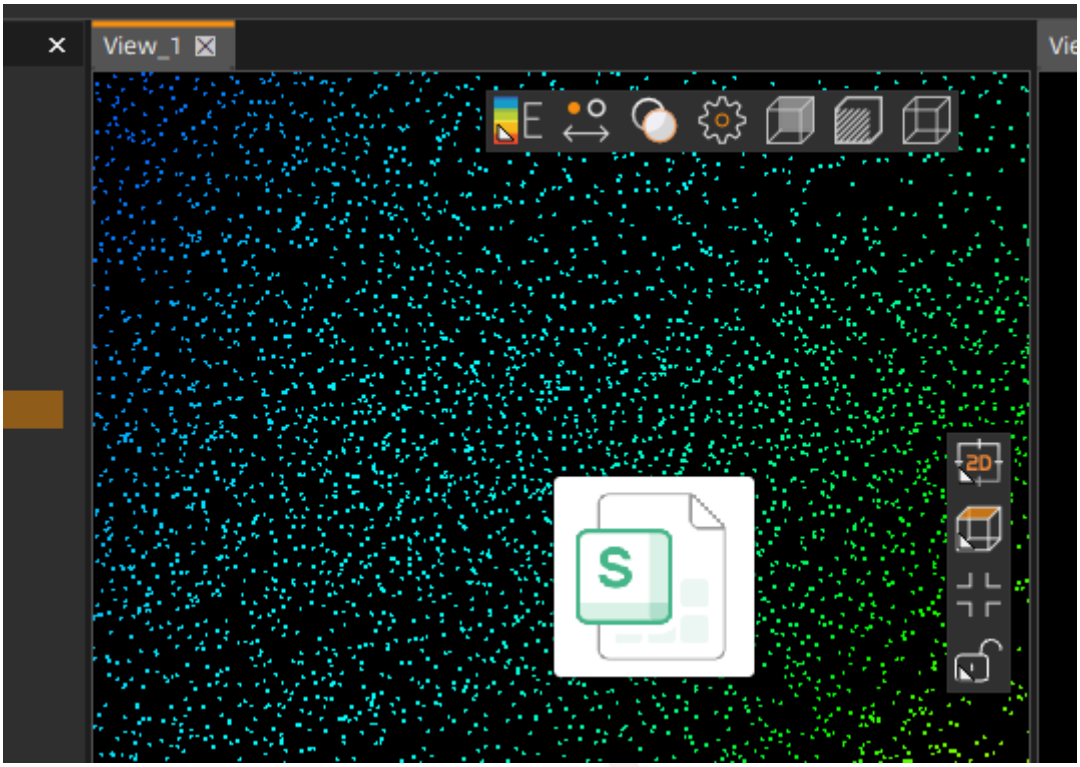


Figure: Dragging Data to View Window

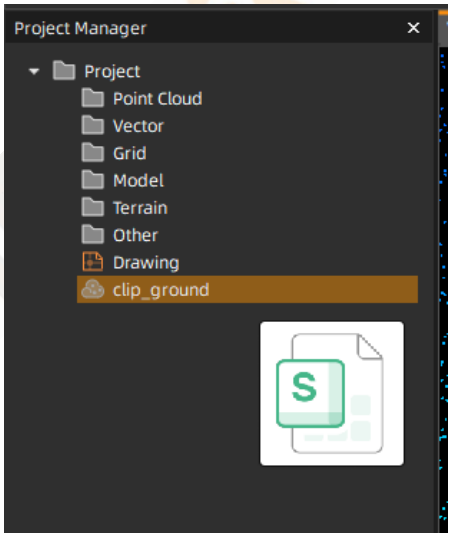


Figure: Dragging Data to project Management Panel

2.3.7.2.1.13 Close

Function Description:

Deletes data from the project management node.

Operation Steps:

① Select data in the data panel, right-click to pop up the menu, select "Close" to delete the data from the project management node and the view.

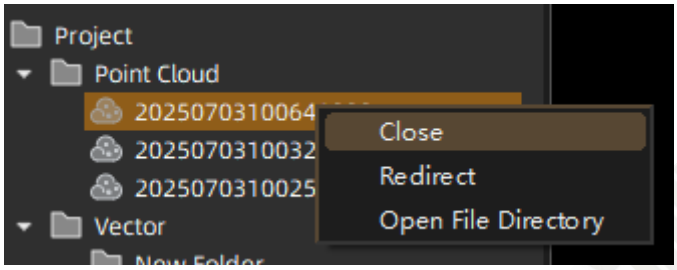


Figure: Close Data

2.3.7.2.1.14 Redirect

Function Description:

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

Operation Steps:

① Select data in the data panel, right-click to pop up the menu, select "Redirect", and re-select the loaded data path in the pop-up selection box.

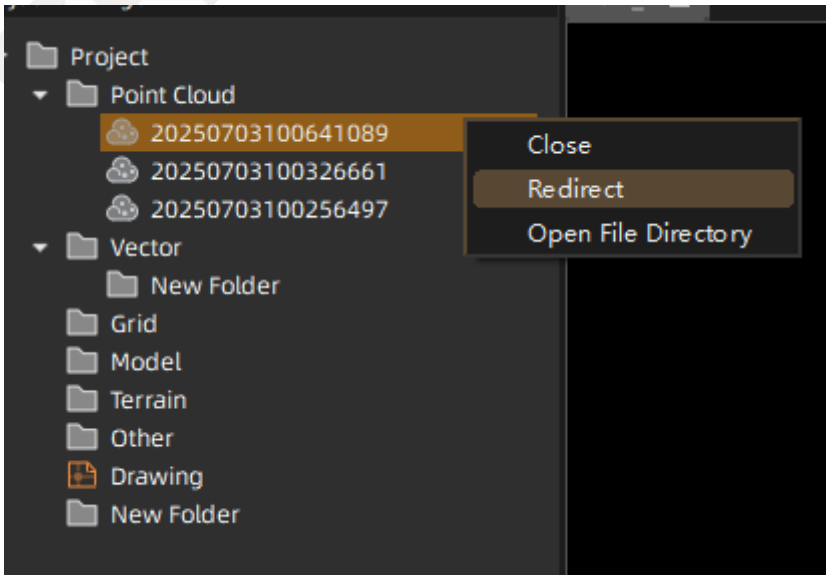


Figure: Redirect

2.3.7.2.1.15 Open File Directory

Function Description:

Opens the storage directory of the data file in the data panel.

Operation Steps:

① Select data in the data panel, right-click to pop up the menu, select "Open File Directory" to pop up the Windows File Explorer and open the directory where the data is located.

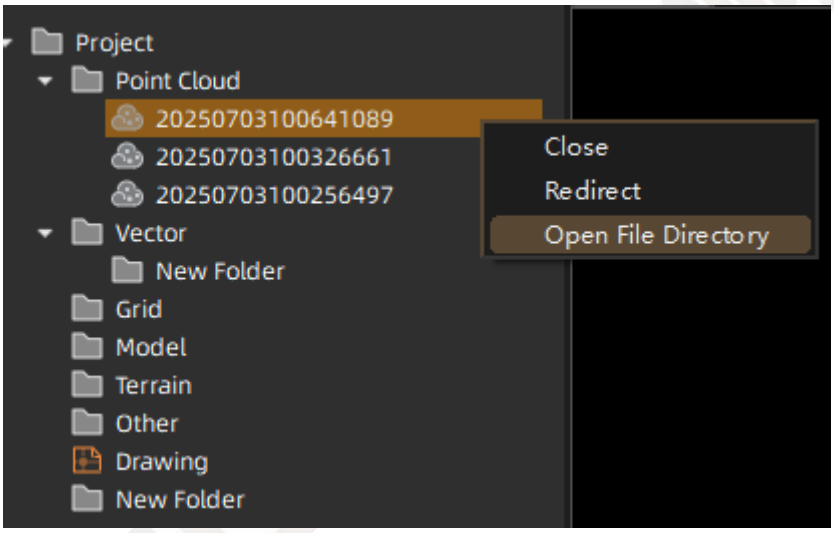


Figure: Open Folder

2.3.7.2.1.16 Activate Drawing

Function Description:

Activate the drawing.

Operation Steps:

① Load vector data.

② Right-click and select "Set Activate" to make the vector data active and editable.

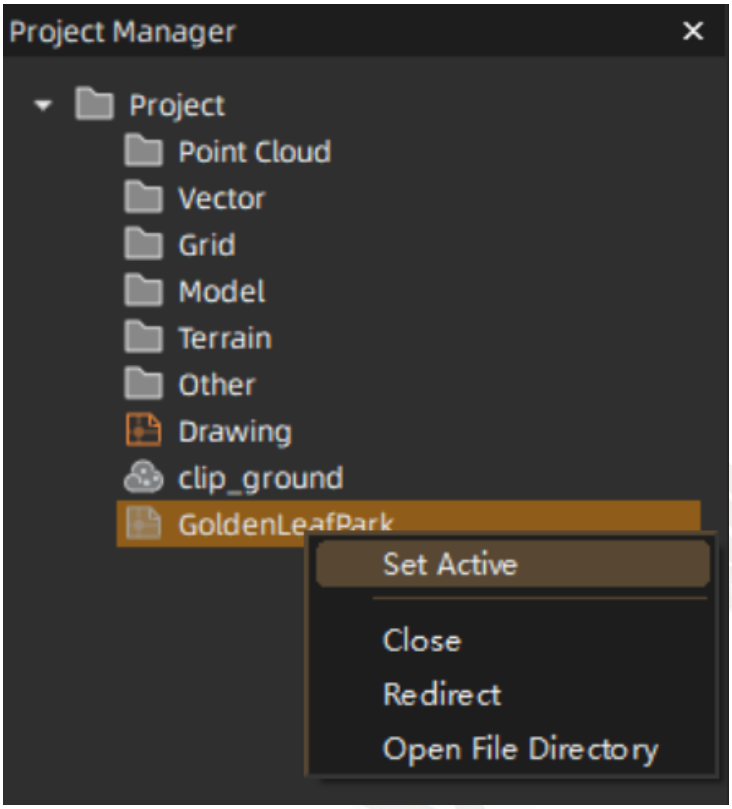


Figure: Activate Drawing

2.3.7.2.2 View Management Panel

2.3.7.2.2.1 Close

Function Description:

Close the selected view and the data within it, but the data remains in the data panel and is not removed, and can be dragged to other views.

Operation Steps:

In the view panel, select one or more displayed views, right-click, and select "Close" in the pop-up menu to close the selected views.

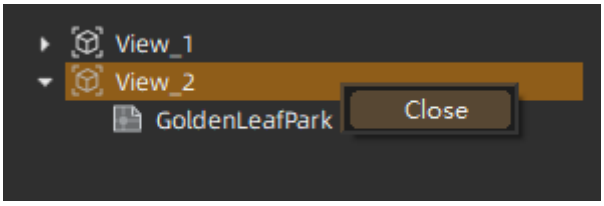


Figure: Close View

2.3.7.2.2.2 Center

Function Description:

Display the selected data centered in the view.

Operation Steps:

In the view panel, select one or more displayed data, right-click, and select "Set Center" in the pop-up menu. The selected data will be displayed centered in the view.

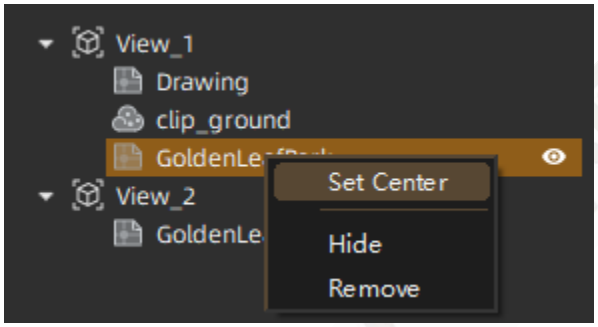


Figure: Center Display Data

2.3.7.2.2.3 Hide

Function Description:

Hide the displayed data in the view.

Operation Steps:

In the view panel, select one or more displayed data, right-click, and select "Hide" in the pop-up menu, or click the small eye icon on the right  indicates the data is in the displayed state,  indicates the data is in the hidden state.

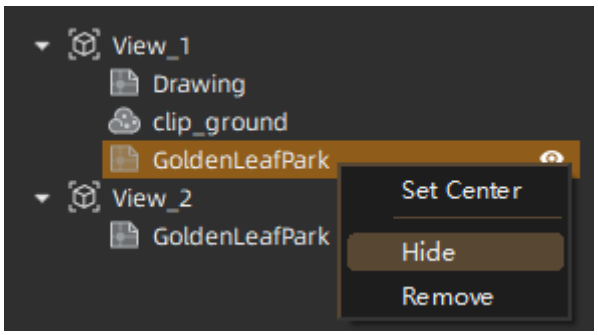


Figure: Hide Data

2.3.7.2.2.4 Show

Function Description:

Display hidden data in the view.

Operation Steps:

① In the view panel, select one or more hidden data, right-click, and select "Show" in the pop-up menu, or click the small eye icon on the right

②  indicates the data is in the displayed state;  indicates the data is in the hid den state.

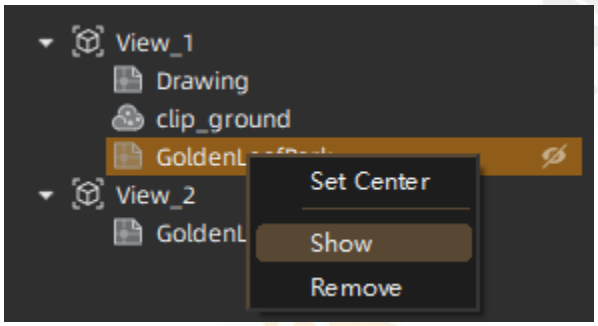


Figure: Show Data

2.3.7.2.2.5 Remove

Function Description:

Remove one or more data from the view.

Operation Steps:

In the view panel, select one or more displayed data, right-click, and select "Remove" in the pop-up menu.

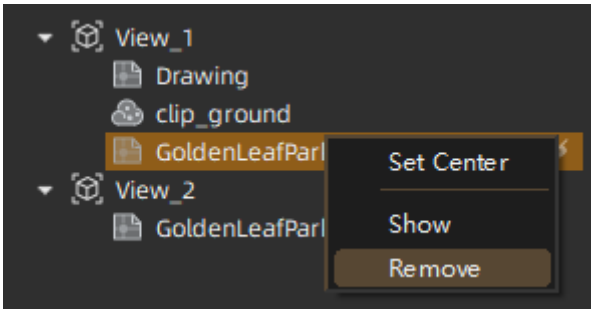


Figure: Remove Data

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

2.3.7.3 Property Panel

Function Description:

When a vector is selected, the property panel allows viewing or modifying all public attribute information of the selected vector. Click Base -> Property Panel to show or hide the property panel.

2.3.7.3.1 Point

Function Description:

When only point elements are selected, the property panel displays the attribute information of the selected points.

Operation Steps:

① In the view, select one or more point elements. The information will appear in the property panel.

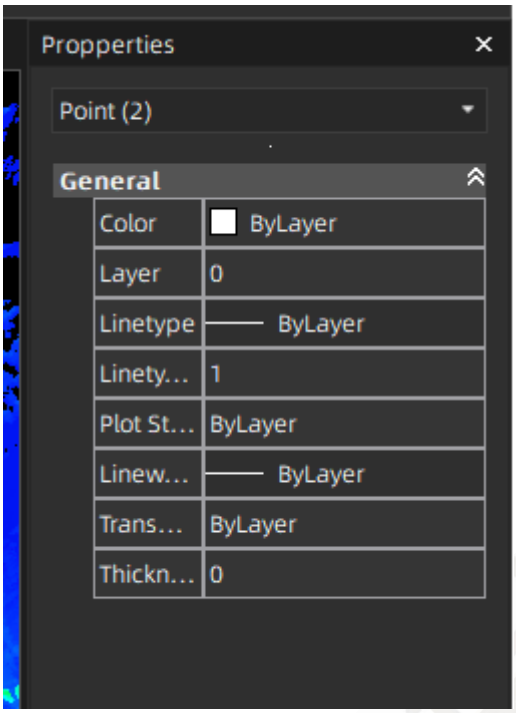


Figure: Point Information in Property Panel

② In the property panel, the color, layer, line type, line type scale, line width, and t ransparency of point elements can be adjusted by selecting from drop-down boxe s.

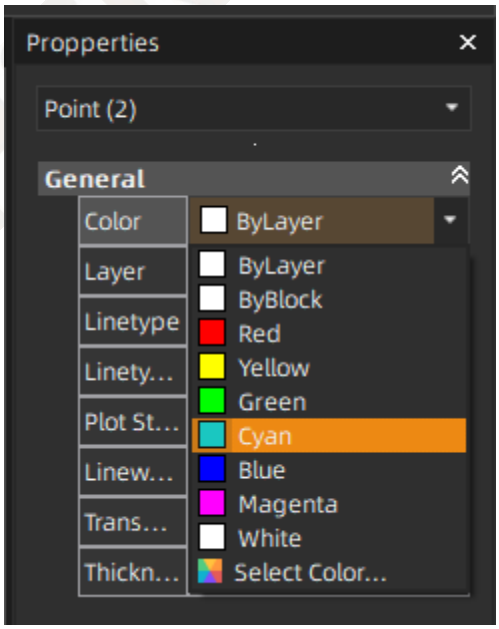


Figure: Modify Point Information via Drop-down in Property Panel

③ In the property panel, the line type scale and thickness of points can be adjusted by inputting values.

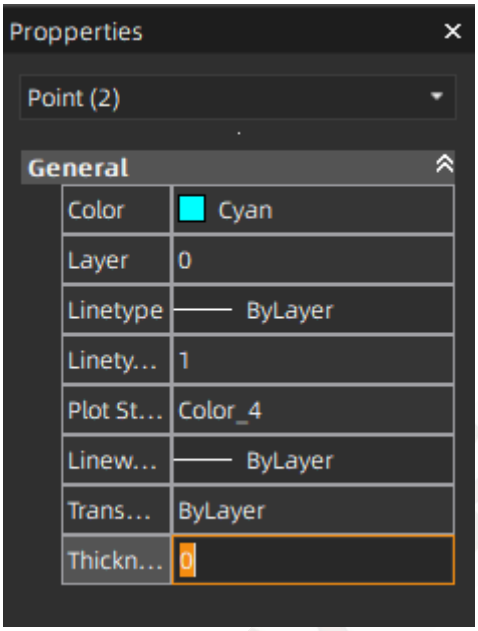


Figure: Modify Point Information via Input in Property Panel

2.3.7.3.2 Line

Function Description:

When only line features are selected, the property panel displays the attribute information of the selected lines.

Operation Steps:

① In the view, select one or more line data. The information of the selected lines will appear in the property panel.

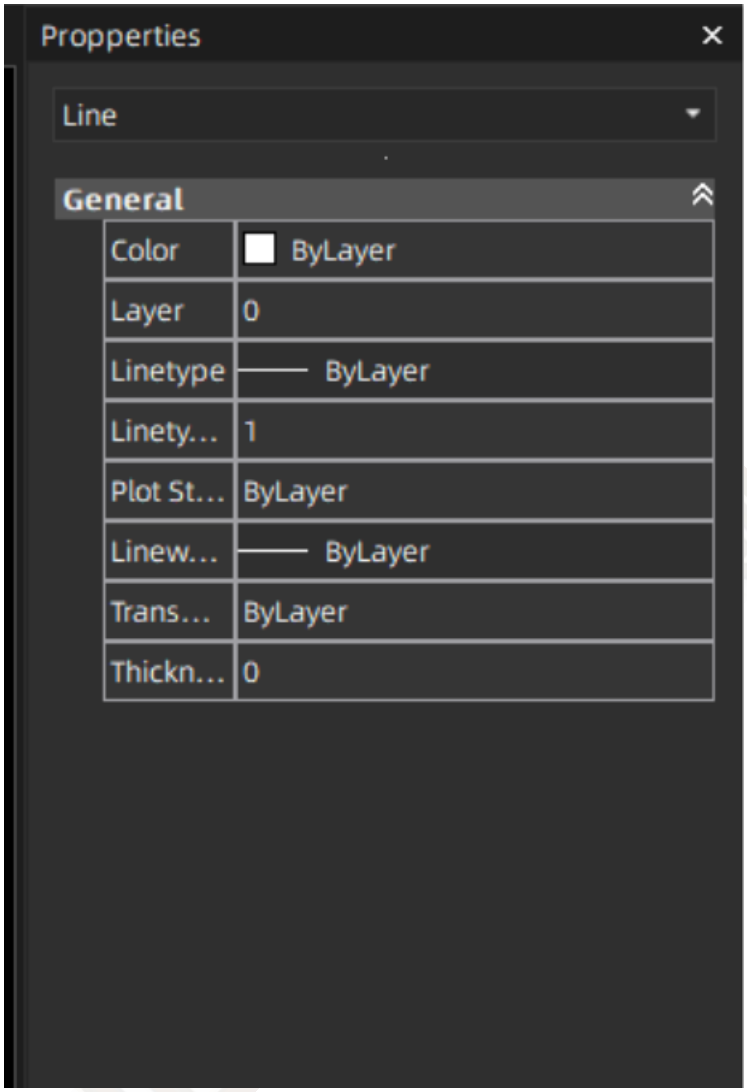


Figure: Line Information in Property Panel

② In the property panel, the color, layer, line type, line type scale, line width, and t ransparency of lines can be adjusted by selecting from drop-down boxes.

③ In the property panel, the line type scale and thickness of lines can be adjusted by inputting values.

2.3.7.3.3 Polyline

Function Description:

When only polyline elements are selected, the property panel displays the attribute inf ormation of the selected polylines.

Operation Steps:

① In the view, select one or more polyline data. The information of the selected po lylines will appear in the property panel.

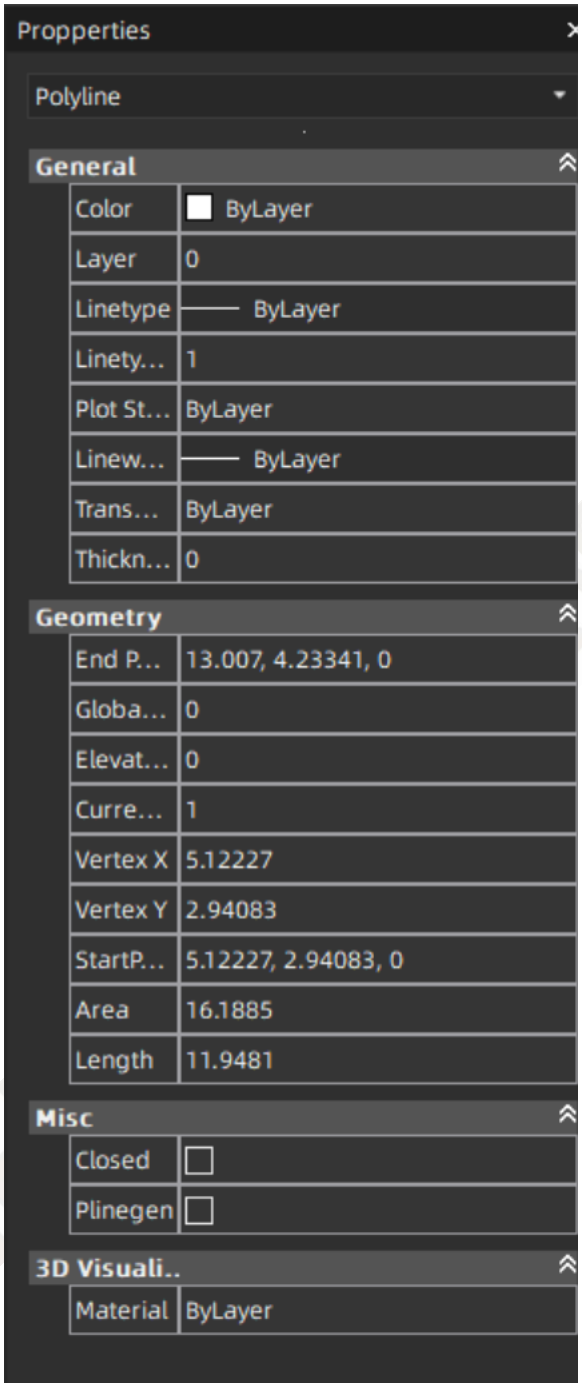


Figure: Selected Polyline

② In the property panel, the color, layer, line type, line type scale, line width, and t ransparency of polylines can be adjusted by selecting from drop-down boxes.

③ In the property panel, the line type scale, thickness, vertex number, and elevation of polylines can be adjusted by inputting values.

④ In the property panel, the on/off status of the closed and line type generation fun ctions can be modified by checking or unchecking the checkboxes.

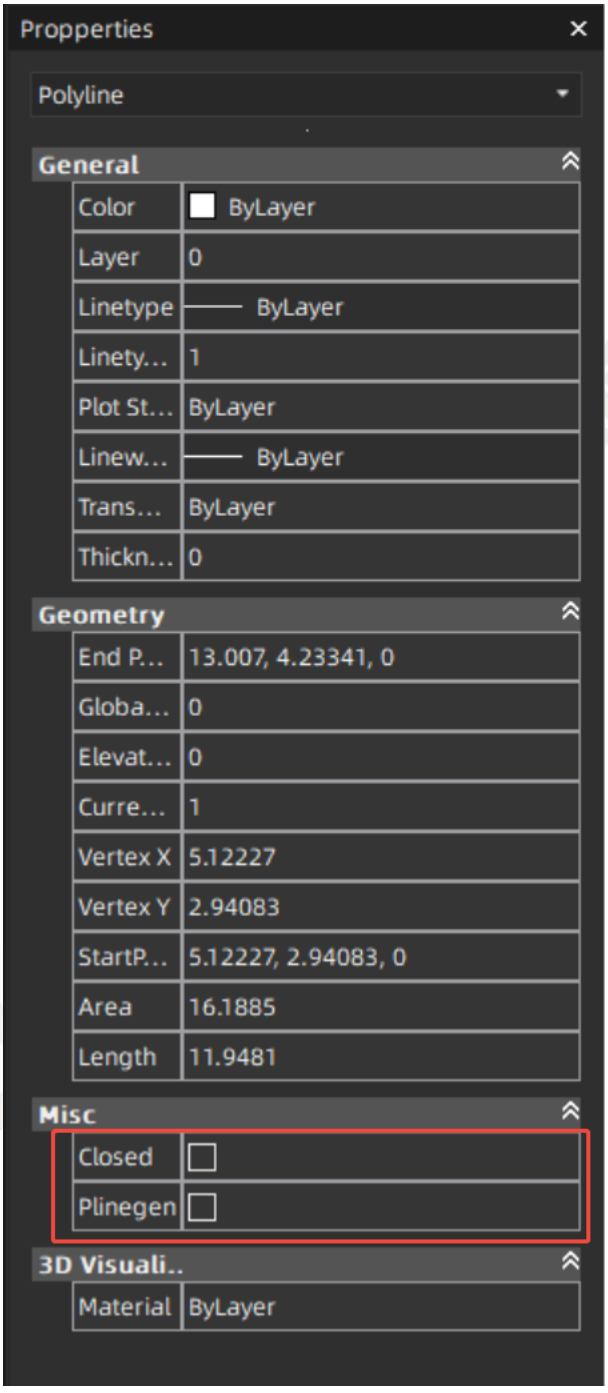


Figure: Check Options in Property Panel

2.3.7.3.4 3D Polyline

Function Description:

When only 3D polyline elements are selected, the property panel displays the attribute information of the selected 3D polylines.

Operation Steps:

① In the view, select one or more 3D polyline data. The information of the selected 3D polylines will appear in the property panel.

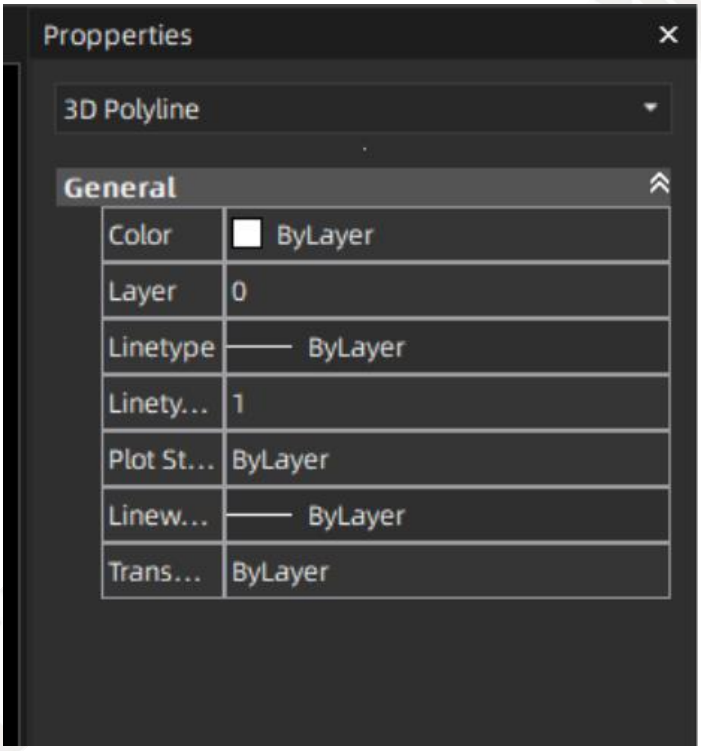


Figure: Selected 3D Polyline

② In the property panel, the color, layer, line type, line type scale, line width, and transparency of 3D polylines can be adjusted by selecting from drop-down boxes.

③ In the property panel, the line type scale and thickness of 3D polylines can be adjusted by inputting values.

2.3.7.3.5 Circle

Function Description:

When only circle elements are selected, the property panel displays the attribute information of the selected circles.

Operation Steps:

① In the view, select one or more circles. The information of the selected circles will appear in the property panel.

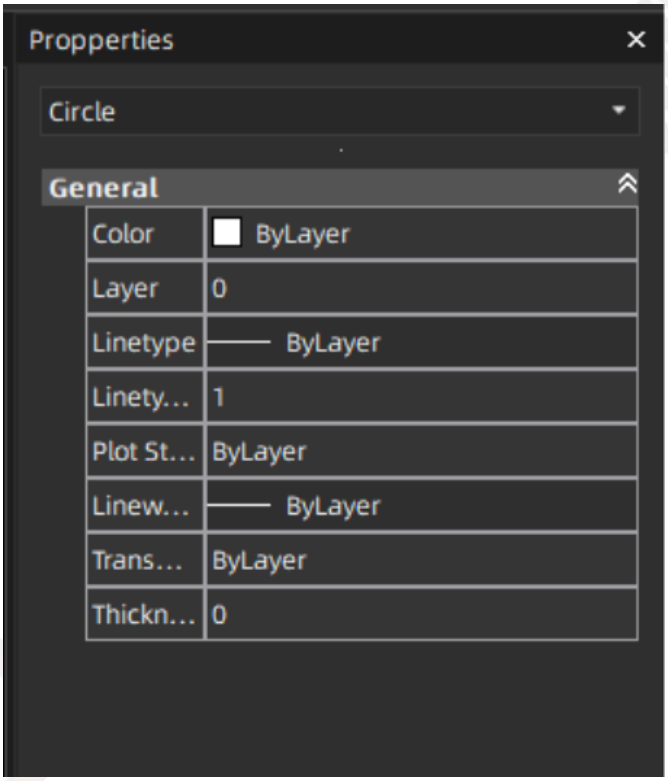


Figure: Selected Circle

② In the property panel, the color, layer, line type, line type scale, line width, and transparency of circles can be adjusted by selecting from drop-down boxes.

③ In the property panel, the line type scale and thickness of circles can be adjusted by inputting values.

2.3.7.3.6 Arc

Function Description:

When only arc elements are selected, the property panel displays the attribute information of the selected arcs.

Operation Steps:

① In the view, select one or more arcs. The information of the selected arcs will appear in the property panel.

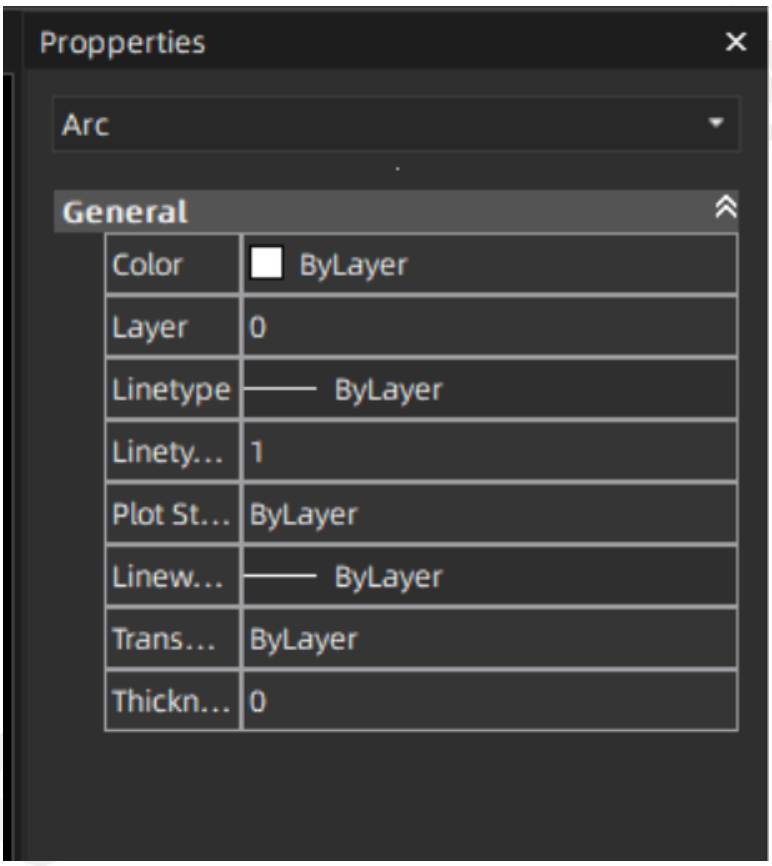


Figure: Selected Arc

② In the property panel, the color, layer, line type, line type scale, line width, and transparency of arcs can be adjusted by selecting from drop-down boxes.

③ In the property panel, the line type scale and thickness of arcs can be adjusted by inputting values.

2.3.7.3.7 Spline Curve

Function Description:

When only spline curve elements are selected, the property panel displays the attribute information of the selected spline curves.

Operation Steps:

① In the view, select one or more spline curves. The information of the selected sp line curves will appear in the property panel.

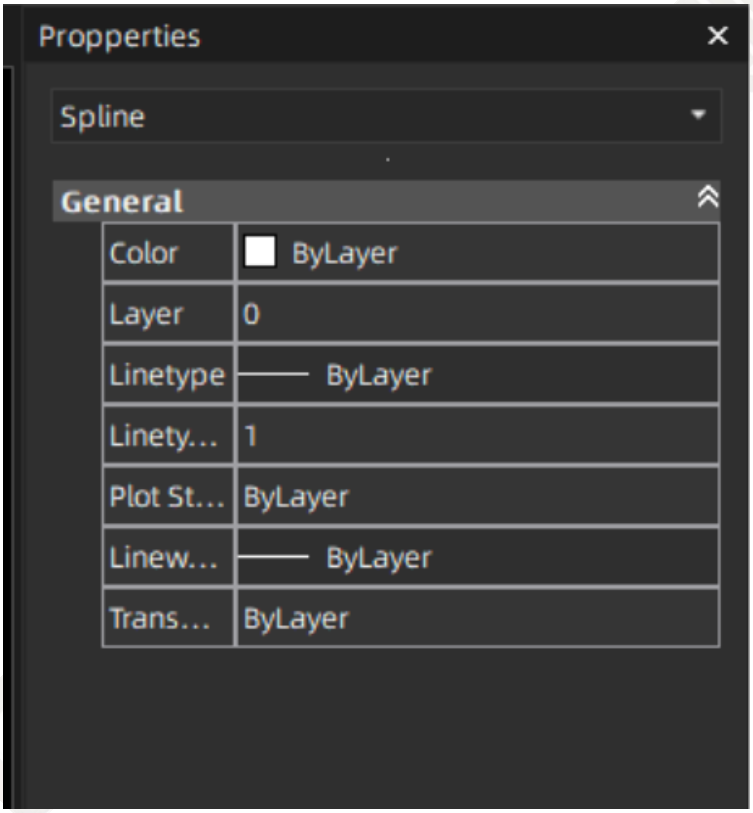


Figure: Selected Spline Curve

② In the property panel, the color, layer, line type, line type scale, line width, and t ransparency of spline curves can be adjusted by selecting from drop-down boxes.

③ In the property panel, the line type scale and thickness of spline curves can be a djusted by inputting values.

2.3.7.3.8 Pattern Fill

Function Description:

When only pattern fill elements are selected, the property panel displays the attribute i nformation of the selected pattern fills.

Operation Steps:

① In the view, select one or more pattern fills. The information of the selected patt ern fills will appear in the property panel.

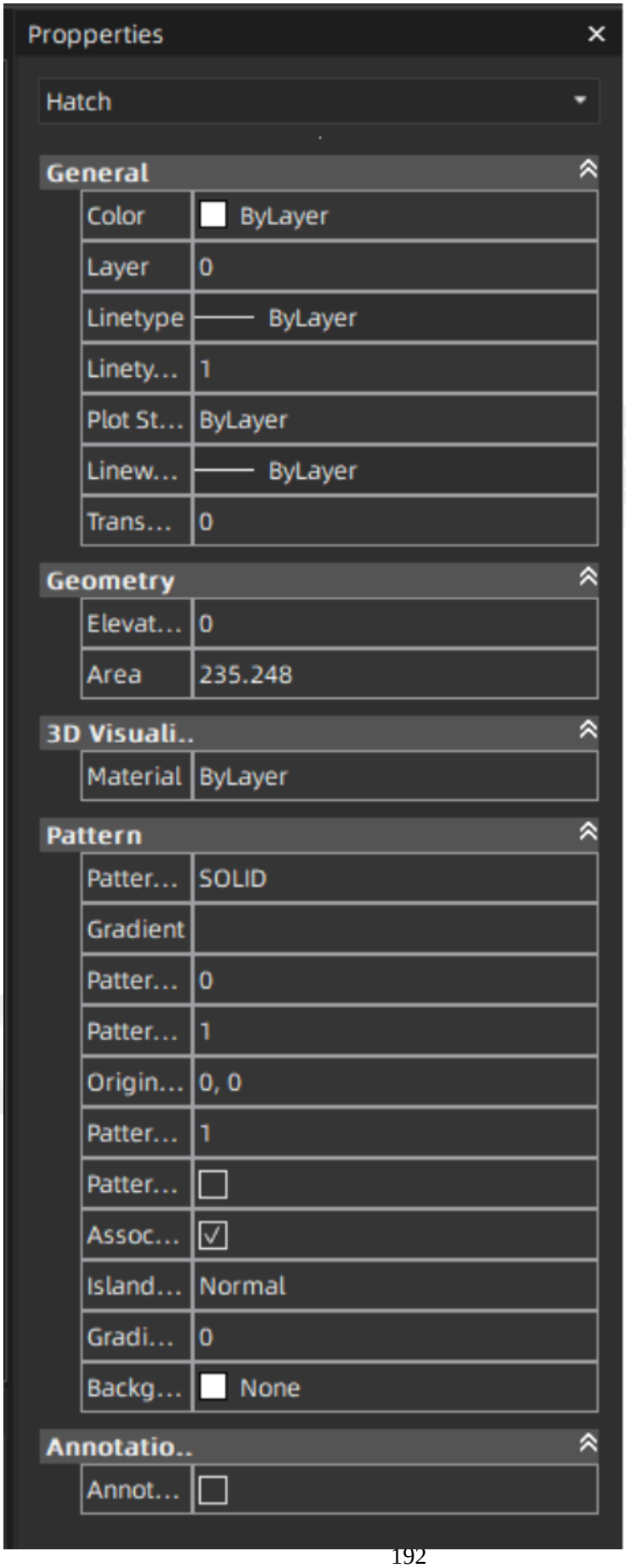

Propperties
Hatch
General
Color
ByLayer
Layer
0
Linetype
ByLayer
Linety...
1
Plot St...
ByLayer
Linew...
ByLayer
Trans...
0
Geometry
Elevat...
0
Area
235.248
3D Visuali..
Material
ByLayer
Pattern
Patter...
SOLID
Gradient
Patter...
0
Patter...
1
Origin...
0, 0
Patter...
1
Patter...
Assoc...
Island...
Normal
Gradi...
0
Backg...
None
Annotatio..
Annot...

Figure: Selected Pattern Fill

② In the property panel, the color, layer, line type, line type scale, line width, trans parency, and fill style of pattern fills can be adjusted by selecting from drop-dow n boxes.

③ In the property panel, the angle and scale of pattern fills can be adjusted by inp utting values.

④ In the property panel, the on/off status of pattern combination, association, and an notation functions can be modified by checking or unchecking the checkboxes.

2.3.7.3.9 Text

Function Description:

When only text elements are selected, the property panel displays the attribute informa tion of the selected text.

Operation Steps:

① In the view, select one or more text elements. The information of the selected te xt will appear in the property panel.

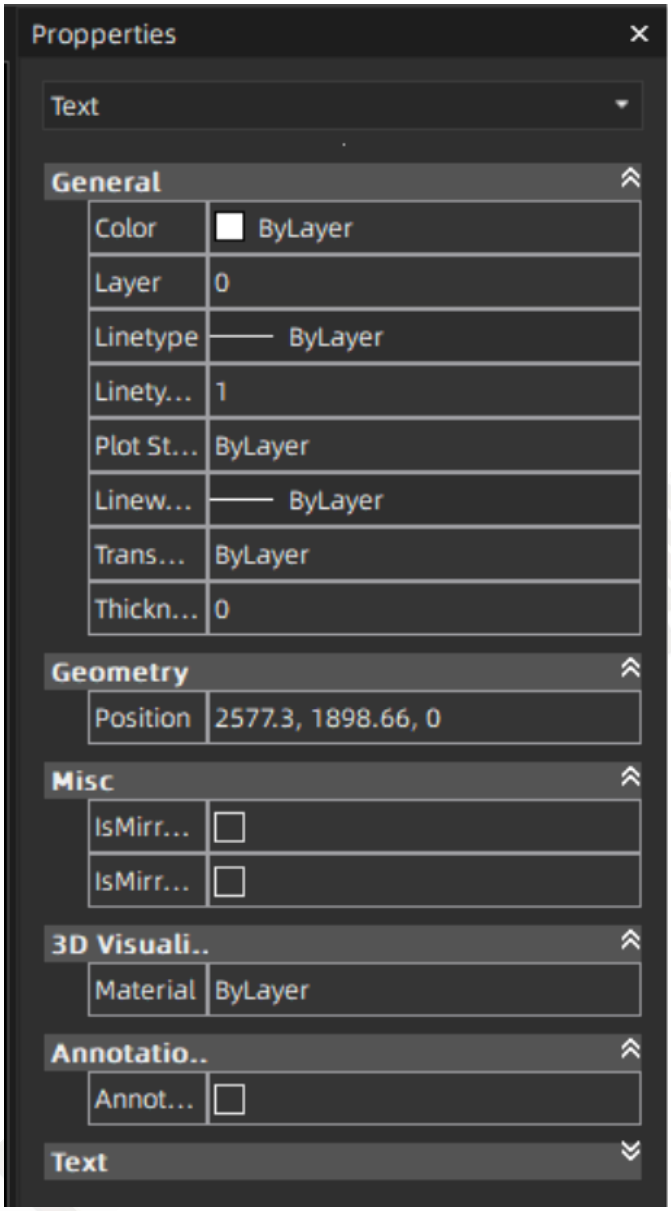


Figure: Selected Text

② In the property panel, the color, layer, line type, line type scale, line width, trans parency, and fill style of text can be adjusted by selecting from drop-down boxes.

③ In the property panel, the thickness and position of text can be adjusted by input ting values.

④ In the property panel, the on/off status of annotation, upside down, and reverse f unctions can be modified by checking or unchecking the checkboxes.

2.3.7.3.10 Multiline Text

Function Description:

When only multiline text elements are selected, the property panel displays the attribut e information of the selected multiline text.

Operation Steps:

① In the view, select one or more multiline text elements. The information of the s elected multiline text will appear in the property panel.

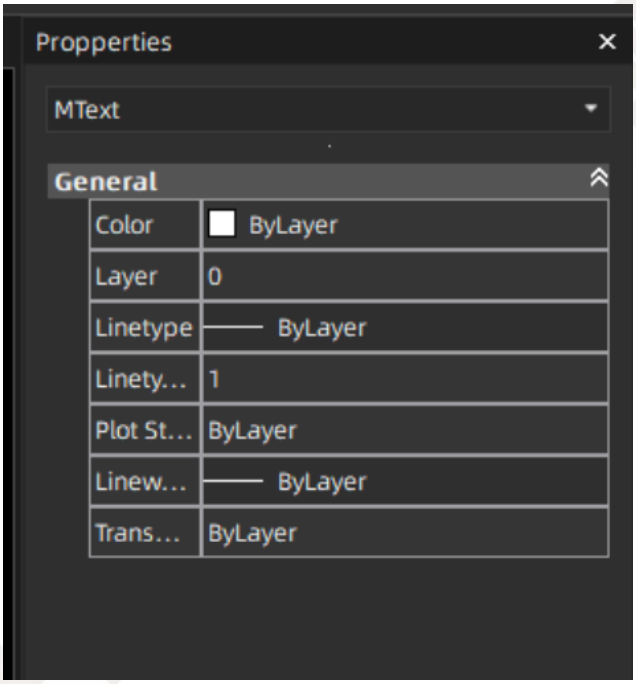


Figure: Selected Multiline Text

In the property panel, the color, layer, line type, line type scale, line width, and trans parency of multiline text can be adjusted by selecting from drop-down boxes.

2.3.7.3.11 Align Dimension

Function Description:

When only aligned dimension elements are selected, the property panel displays the at tribute information of the selected aligned dimensions.

Operation Steps:

① In the view, select one or more aligned dimensions. The information of the select ed aligned dimensions will appear in the property panel.

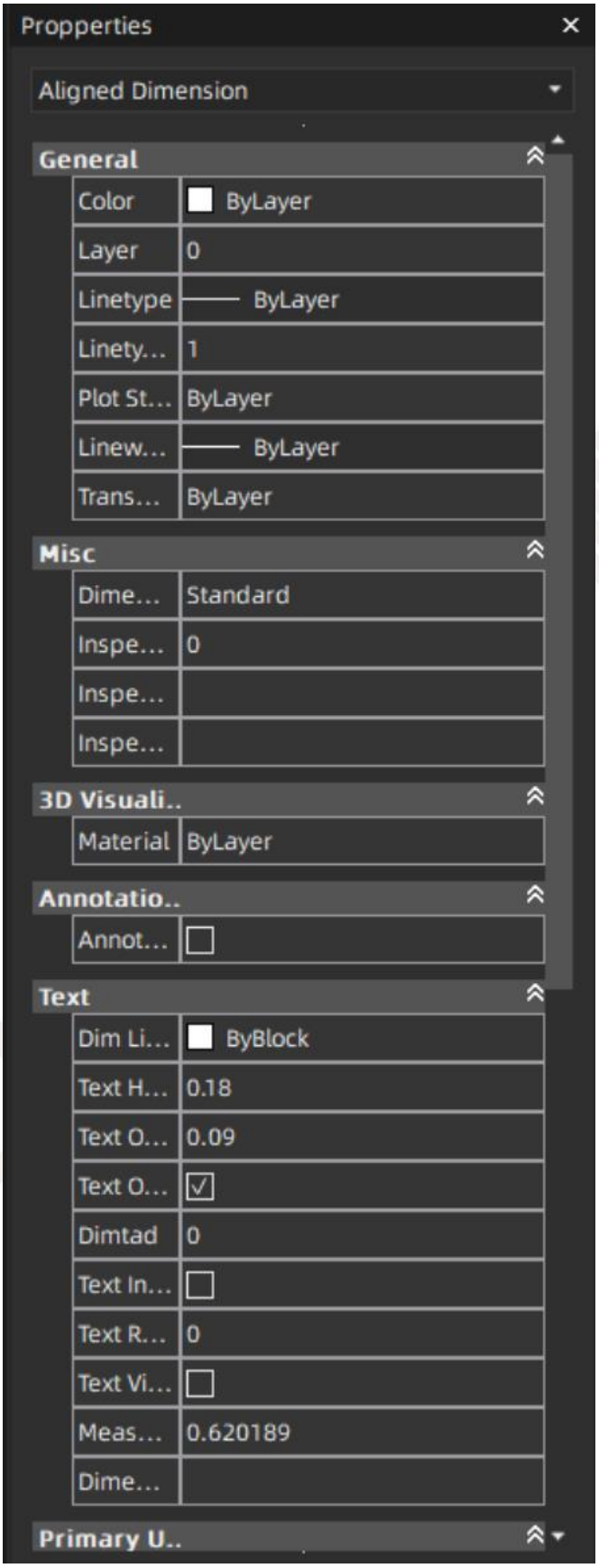

Propperties
Aligned Dimension
General
Color
ByLayer
Layer
0
Linetype
ByLayer
Linety...
1
Plot St...
ByLayer
Linew...
ByLayer
Trans...
ByLayer
Misc
Dime...
Standard
Inspe...
0
Inspe...
Inspe...
3D Visuali..
Material
ByLayer
Annotatio..
Annot...
Text
Dim Li...
ByBlock
Text H...
0.18
Text O...
0.09
Text O...
Dimtad
0
Text In...
Text R...
0
Text Vi...
Meas...
0.620189
Dime...
Primary U..

Figure: Selected Aligned Dimension 1

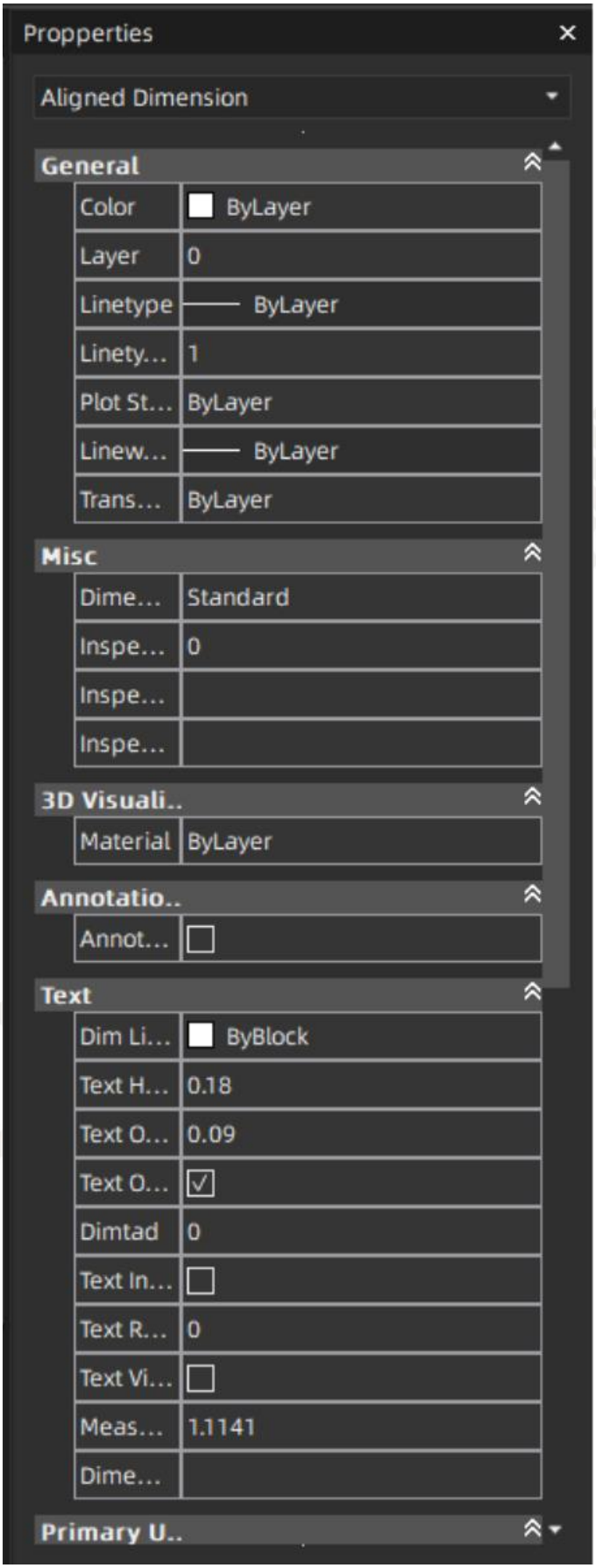

Propperties
Aligned Dimension
General
Color
ByLayer
Layer
0
Linetype
ByLayer
Linety...
1
Plot St...
ByLayer
Linew...
ByLayer
Trans...
ByLayer
Misc
Dime...
Standard
Inspe...
0
Inspe...
Inspe...
3D Visuali..
Material
ByLayer
Annotatio..
Annot...
Text
Dim Li...
ByBlock
Text H...
0.18
Text O...
0.09
Text O...
Dimtad
0
Text In...
Text R...
0
Text Vi...
Meas...
1.1141
Dime...
Primary U..

Figure: Selected Aligned Dimension 2

② In the property panel, the color, layer, line type, line type scale, line width, trans parency, dimension line color, dimension line style, and text color of aligned dim ensions can be adjusted by selecting from drop-down boxes.

③ In the property panel, the dimension line text, text/line spacing, measurement, line type scale, separator, prefix, suffix, multiple dimensioning, tapered dimensioning, dimension precision, dimension scale, dimension，move dimension, shape check, la bel check, inspection rate, text height, and extension length of aligned dimensions can be adjusted by inputting values.

④ In the property panel, the on/off status of arrow/line spacing, text/arrow spacing, t ext reverse, and dimension functions can be modified by checking or unchecking the checkboxes.

2.4 Vector Module

2.4.1 Drawings

2.4.1.1 New Drawing

Function Description:

Create a new drawing in dwg or dxf format.

Operation Steps:

① Click Vector -> Drawings -> New Drawing to pop up the New Drawing dialog box.

② After selecting the save path for the new drawing, enter the name of the new dr awing in the "File name" field. Select ".dxf" or ".dwg" from the drop-down optio ns next to "Save as type" and click "Save" to create a drawing in the correspond ing format. If no selection is made or the default ".dwg;.dxf" is selected, clicking "Save" will create a dwg format drawing by default.

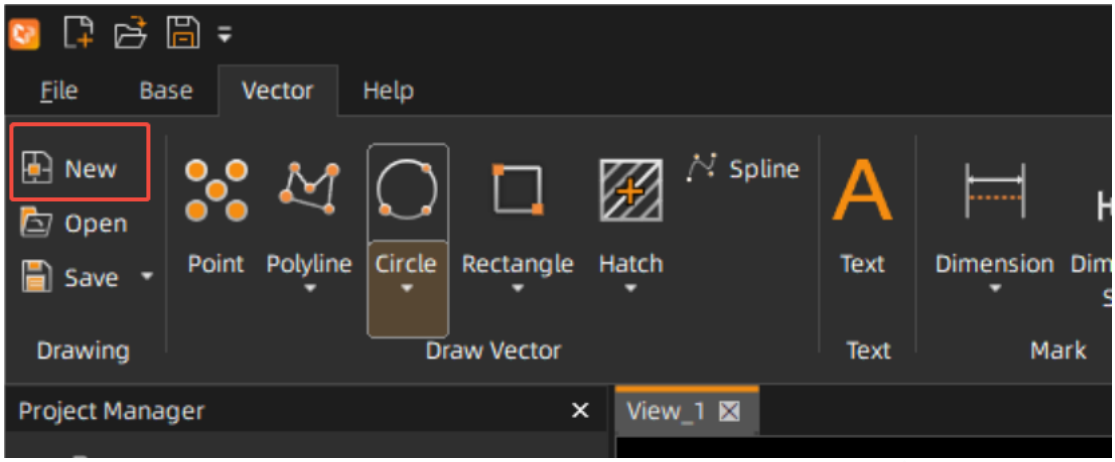


Figure: New Drawing

③ The successfully created drawing is loaded into "Project Management" by default and is in an inactive state.

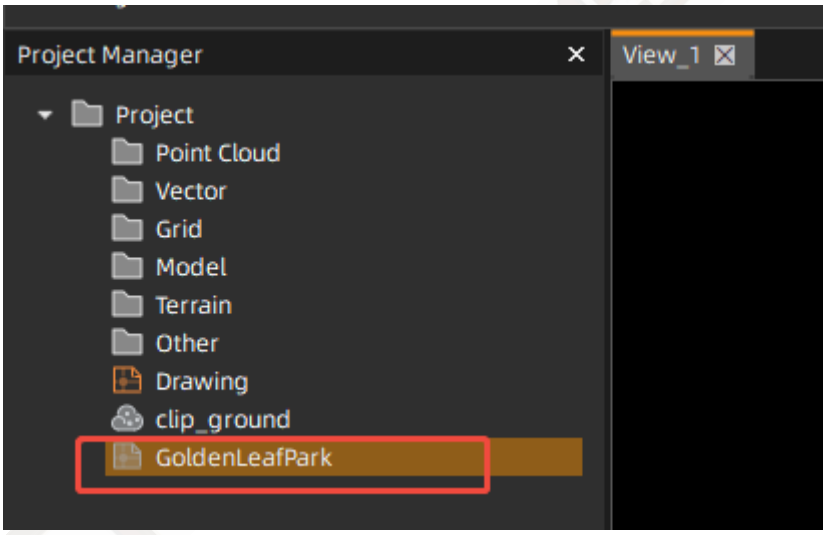


Figure: Project Management

2.4.1.2 Open Drawing

Function Description:

Open a drawing in dwg or dxf format.

Operation Steps:

① Click Vector -> Drawings -> Open Drawing to pop up the Open File dialog box.

② Select the drawing to be opened, or directly enter the absolute path of the drawing in the input box after "", and click "Open" to load the drawing.

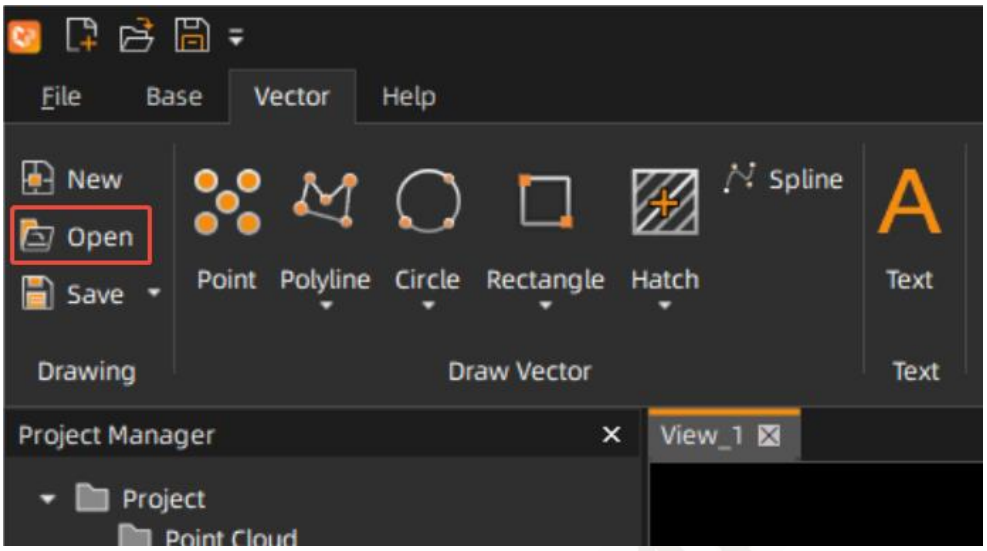


Figure: Open File

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

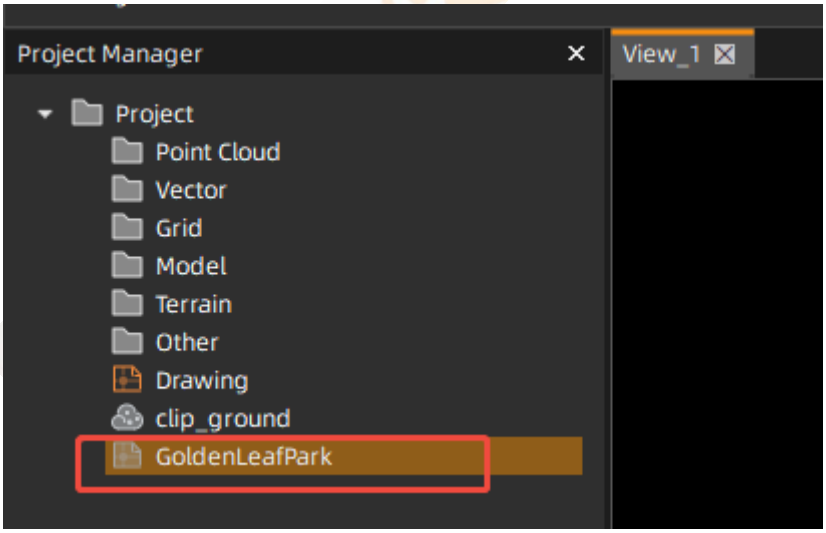


Figure: Project Management

2.4.1.3 Save Drawing

2.4.1.3.1 Save

Function Description:

Save a drawing in dwg or dxf format.

Operation Steps:

① If the drawing already has a path, after clicking Vector -> Drawing -> Save, the output window will prompt successfully saved in currectly path

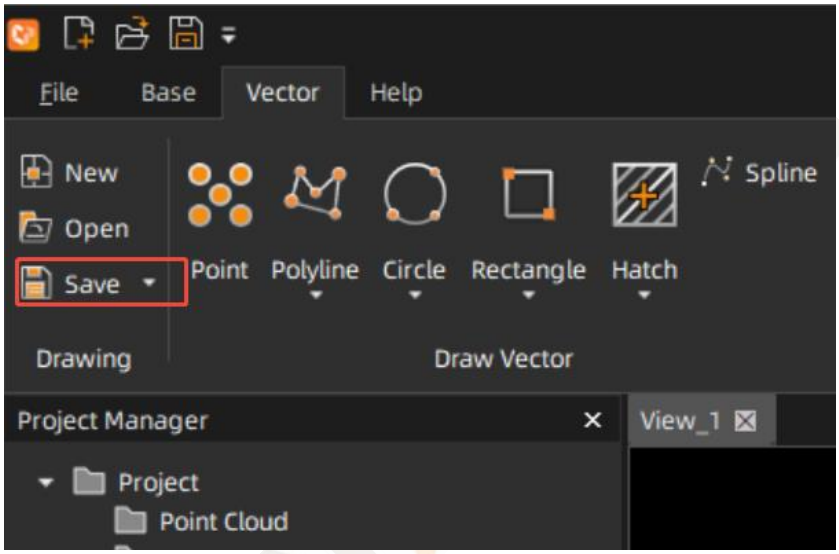


Figure: Save Drawing

② If the drawing has not been saved before, clicking Vector -> Save drawing will p op up the Save Drawing dialog box. The default file name is "Drawing.dwg". Sel ect the path, modify the file name if needed, and click "Save" to save successfull y.

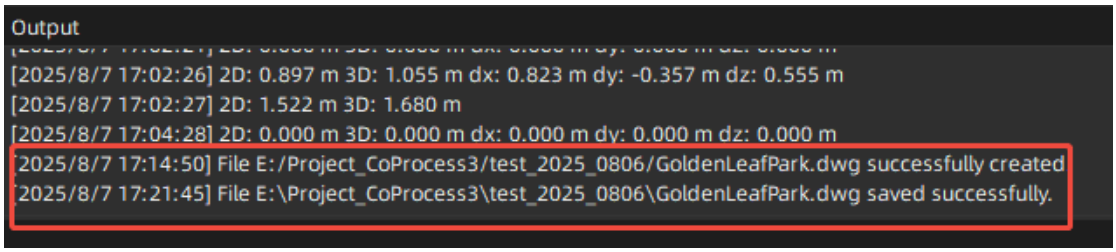


Figure: Save Drawing

③ In a saved drawing or a loaded vector file, when a vector element is drawn or e dited five times, the current drawing will be automatically saved. During saving, a progress bar for saving the drawing will appear in the lower right corner of th e software. After successful saving, the output window will display a prompt mes sage for saving the drawing.

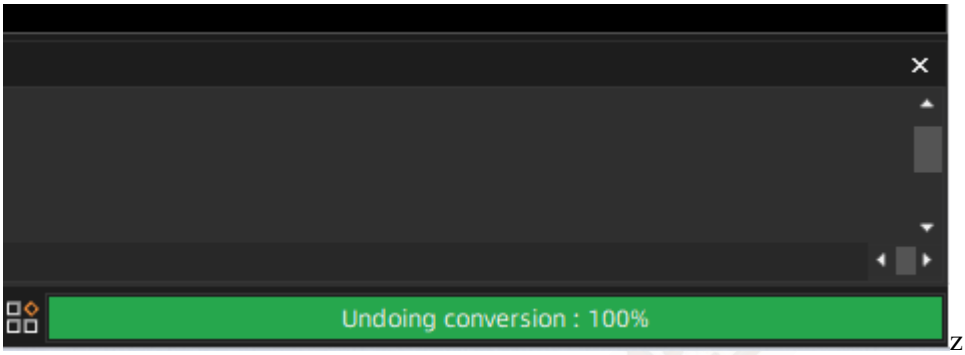


Figure: Auto-Save Progress Bar

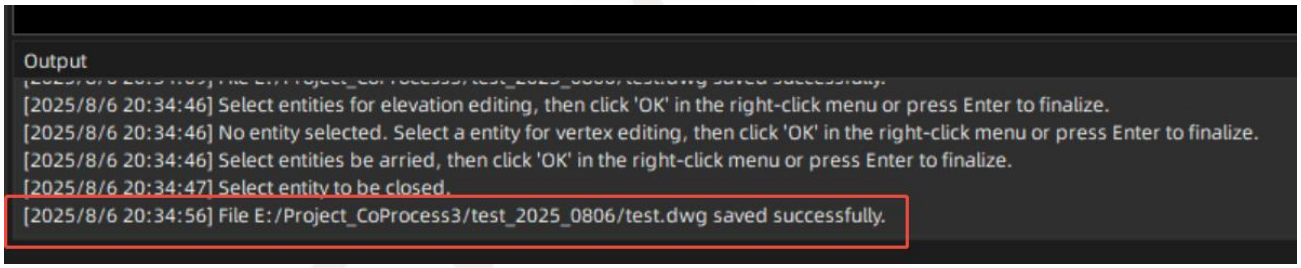


Figure: Auto-Save Prompt

2.4.1.3.1 Save As

Function Description:

Save a drawing as a copy with a specified file name and format.

Operation Steps:

① Click Vector -> Drawings ->" Save as" to pop up the dialog box.

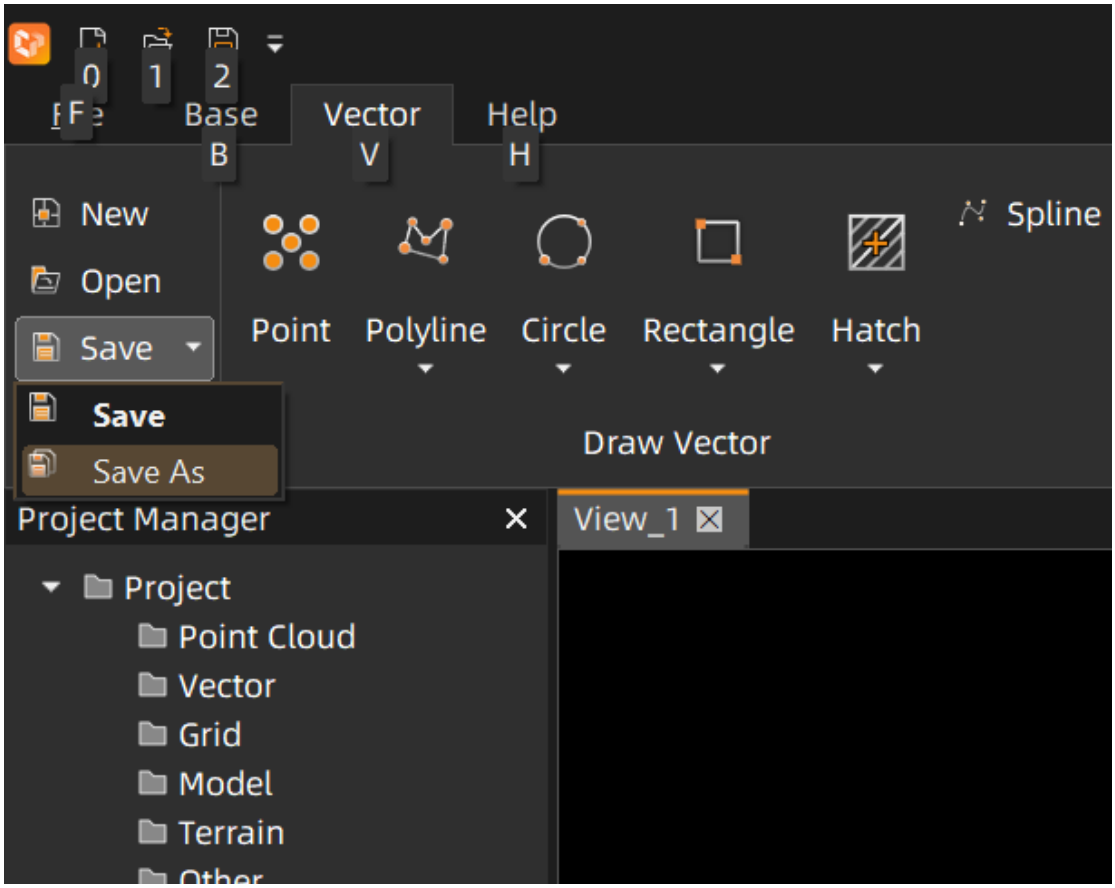


Figure: Save As

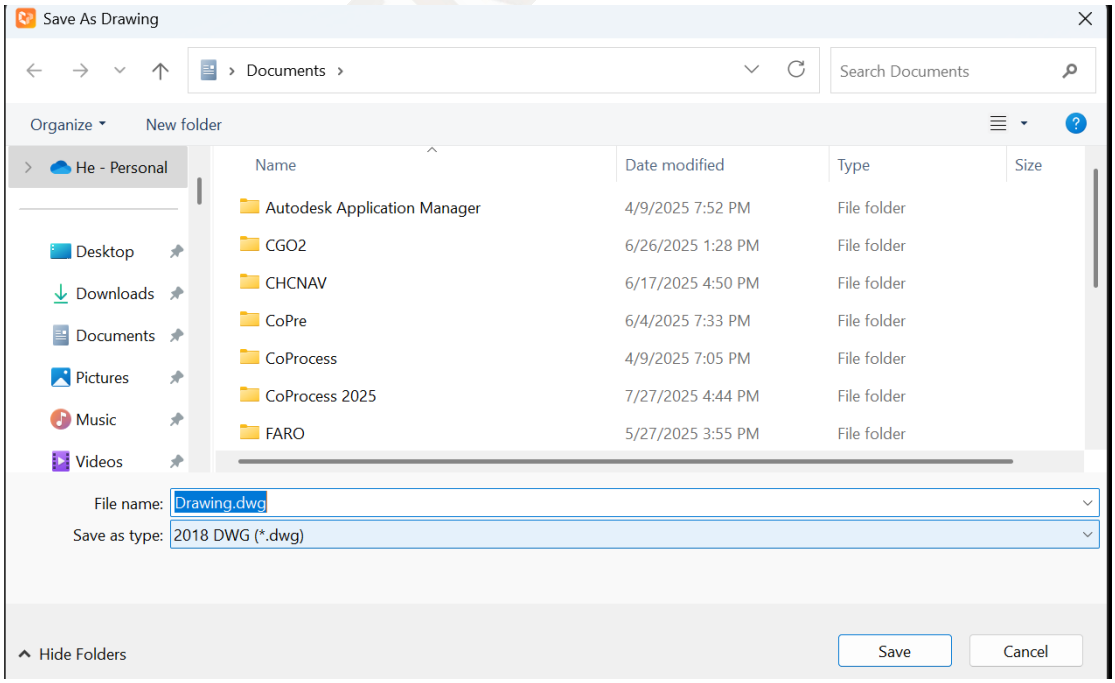


Figure: Saving path dialog box

② Enter the file name and select the save format from the "Save as type" drop-down box. The supported formats are DWG and DXF, as shown in the figure below. T he default format is "2018 DWG (*.dwg)".

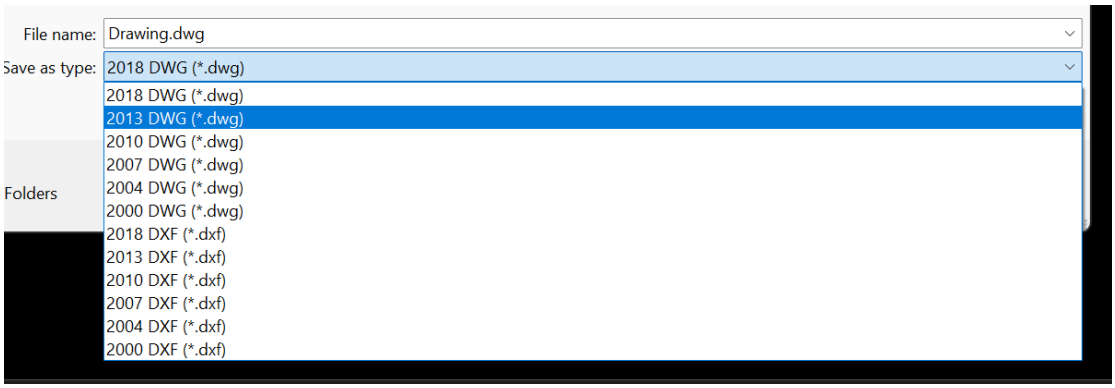


Figure: Save as type

③ Click "Save" to complete "Save As" action.

2.4.2 Draw Vector

2.4.2.1 Point

Function Description:

Draw a point in the drawing.

Operation Steps:

① Click Draw Vector -> Point.

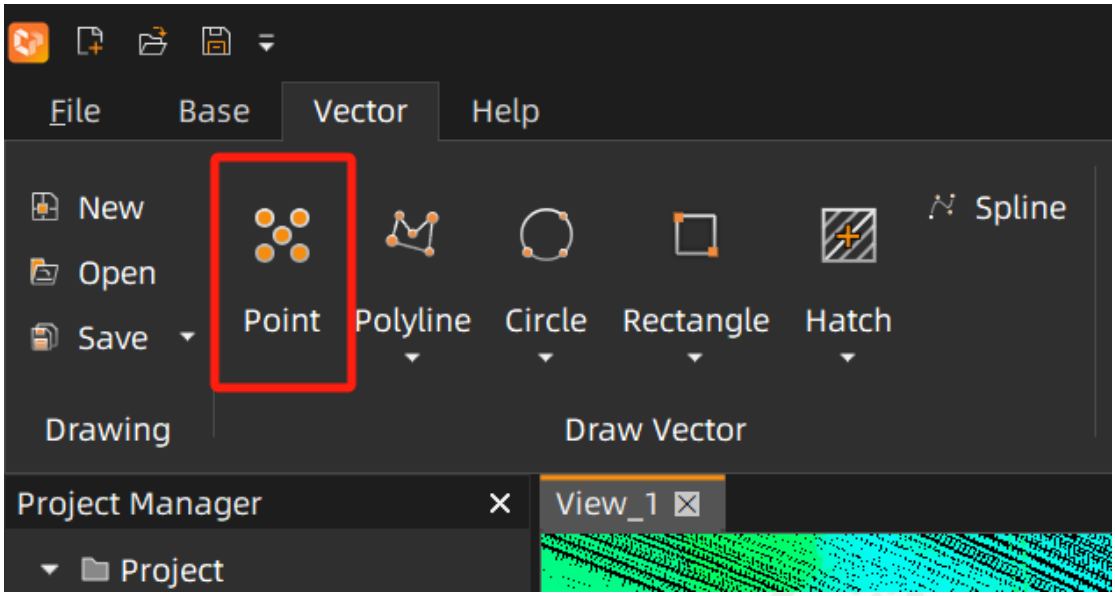


Figure: Point

② In the view, left-click a point to complete the drawing of a point at the clicked position.

2.4.2.2 Polyline

2.4.2.2.1 Vertex Mode

Function Description:

Draw a polyline by determining the endpoints of line segments in the drawing.

Operation Steps:

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

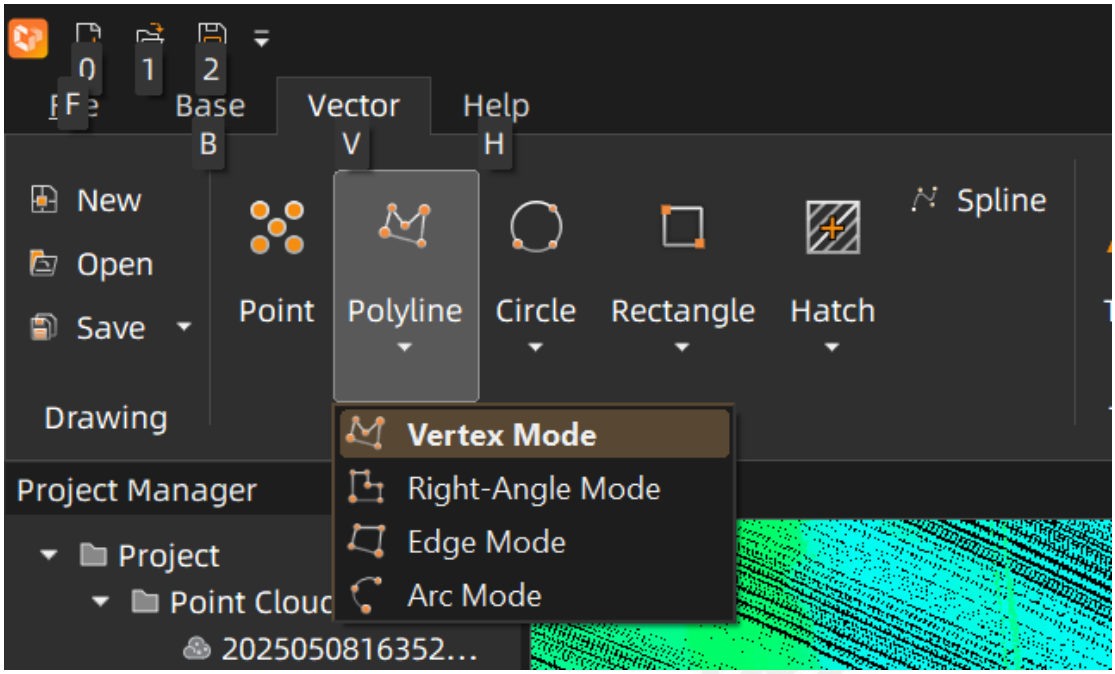


Figure: Vertex Mode

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

③ In the view, click to specify the next endpoint.

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

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

⑥ The default is "2D Drawing". During drawing, the vector elevation is always constrained to the same plane. To draw to the mouse snap position, right-click and select "3D Drawing" to draw to the mouse snap position.

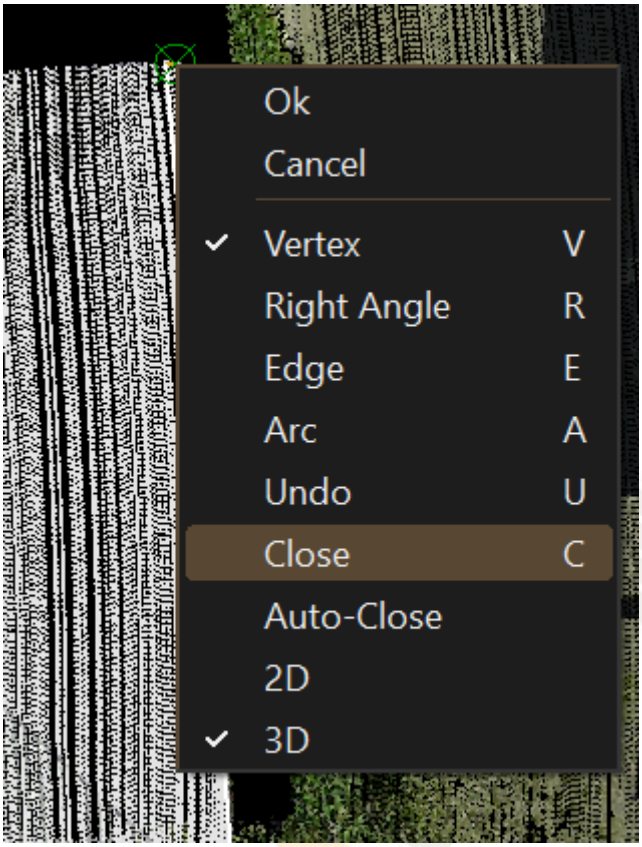


Figure: Right-Click Menu in Vertex Mode

2.4.2.2.2 Right Angle Mode

Function Description:

Draw a polyline in the drawing with right-angle line

Operation Steps:

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

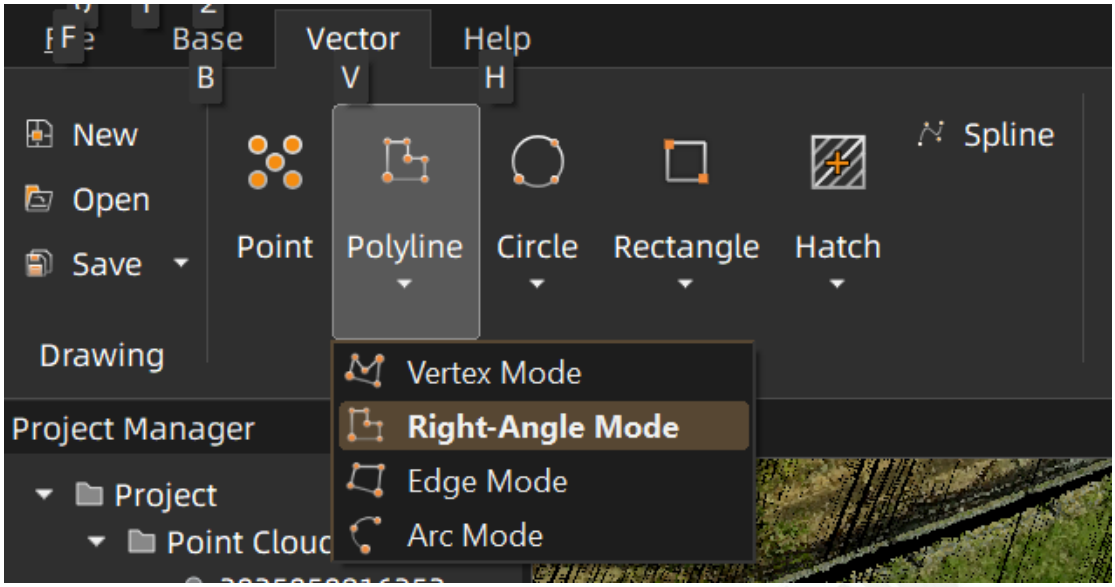


Figure: Right Angle Mode

② In the view, click two points to determine the starting point.

③ In the view, click a point to determine the edge perpendicular to the previous ed ge.

④ In the view, press Enter to end, or right-click and select "Ok" to complete the p olyline drawing. The default polyline is not closed. To draw a closed polyline, ri ght-click "Close" or use the shortcut key C to end the drawing, or right-click an d check "Auto-Close" to close the polyline.

⑤ During the polyline drawing process, right-click and select "Undo Point" or use t he shortcut key U to cancel the previous point.

⑥ The default is "2D Drawing". In right angle mode, the vector elevation is always constrained to the same plane in both "2D Drawing" and "3D Drawing".

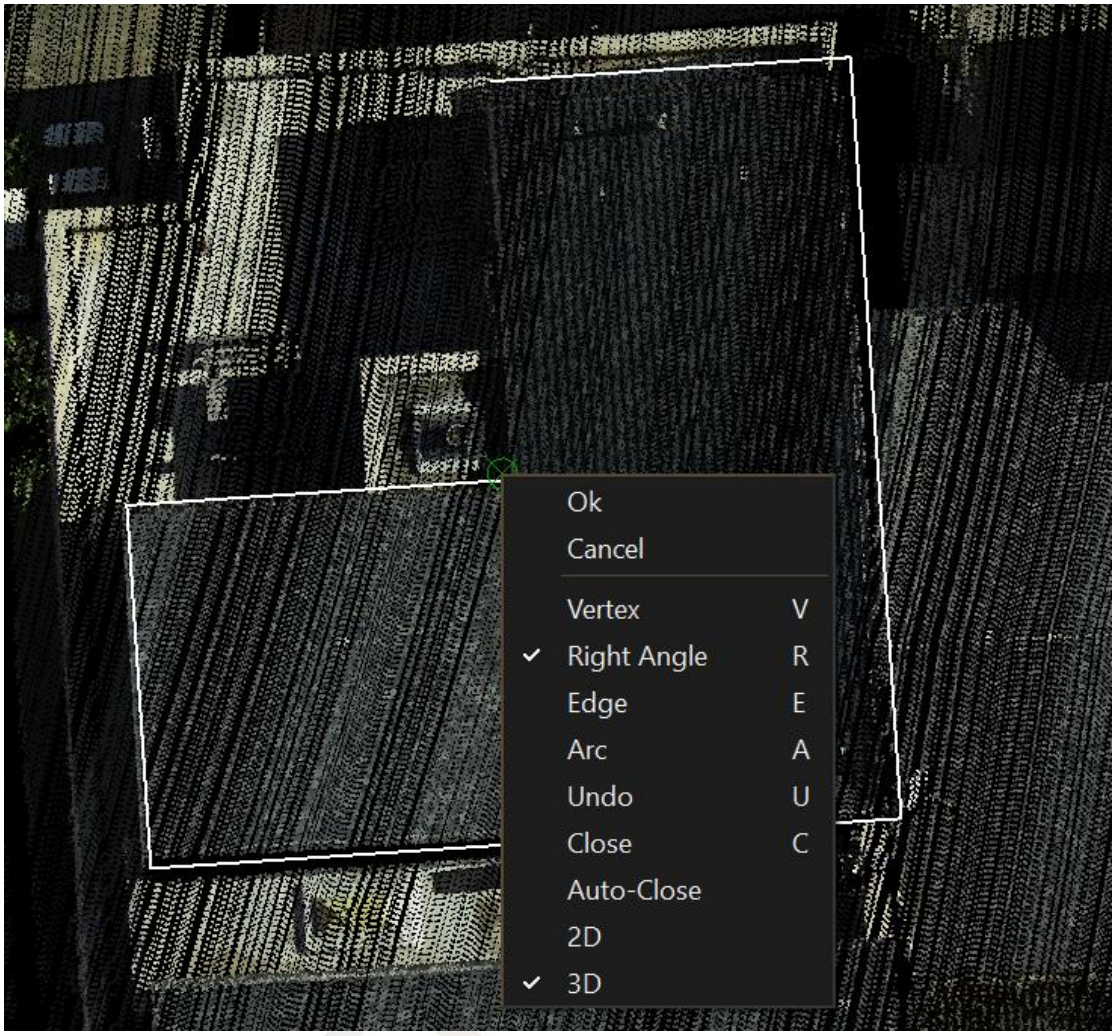


Figure: Right-Click Menu in Right Angle Mode

Note:

① Check "Auto-Close": The first point is closed by drawing a perpendicular line to the last edge.

② Uncheck "Auto-Close": Use the shortcut key C or right-click "Close" to close by directly connecting the first and last points.

2.4.2.2.3 Edge Mode

Function Description:

Draw a polyline in the drawing by drawing two points to determine a line segment i ntersecting the previous edge.

Operation Steps:

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

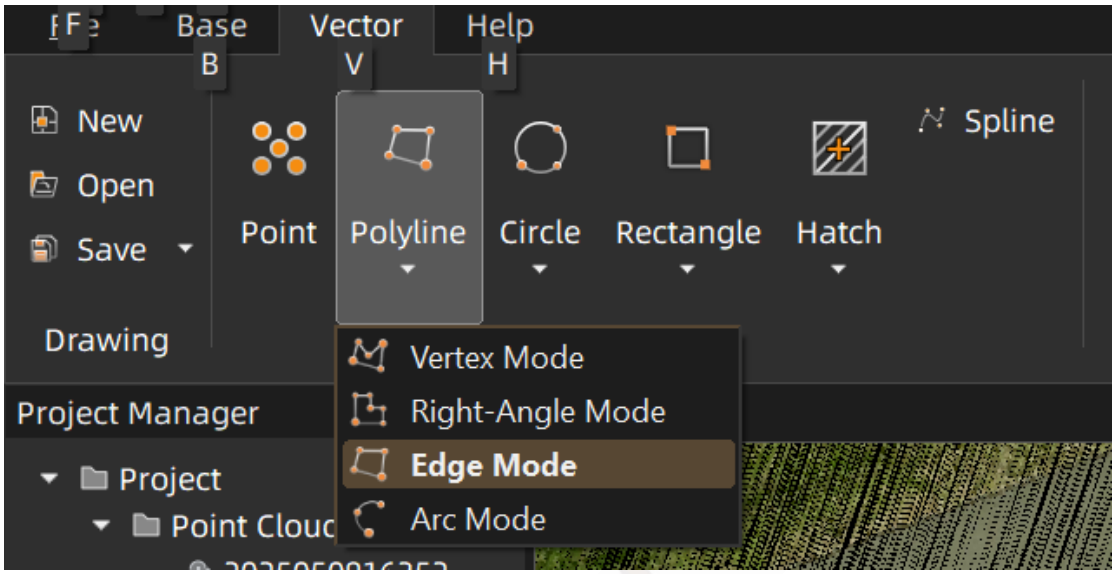


Figure: Edge Mode

② In the view, click two points to determine the first edge of the polyline. And the n click two points to determine another edge, it will intersect to provious edge.

③ In the view, press Enter to end, or right-click and select "Ok" to complete the p olyline drawing. The default polyline is not closed. To draw a closed polyline, ri ght-click "Close" to end the drawing, or right-click and check "Auto-Close" to cl ose the polyline.

④ During the polyline drawing process, right-click and select "Undo Point" or use t he shortcut key U to cancel the previous point.

⑤ The default is "2D Drawing". In edge mode, the vector elevation is always constr ained to the same plane in both "2D Drawing" and "3D Drawing".

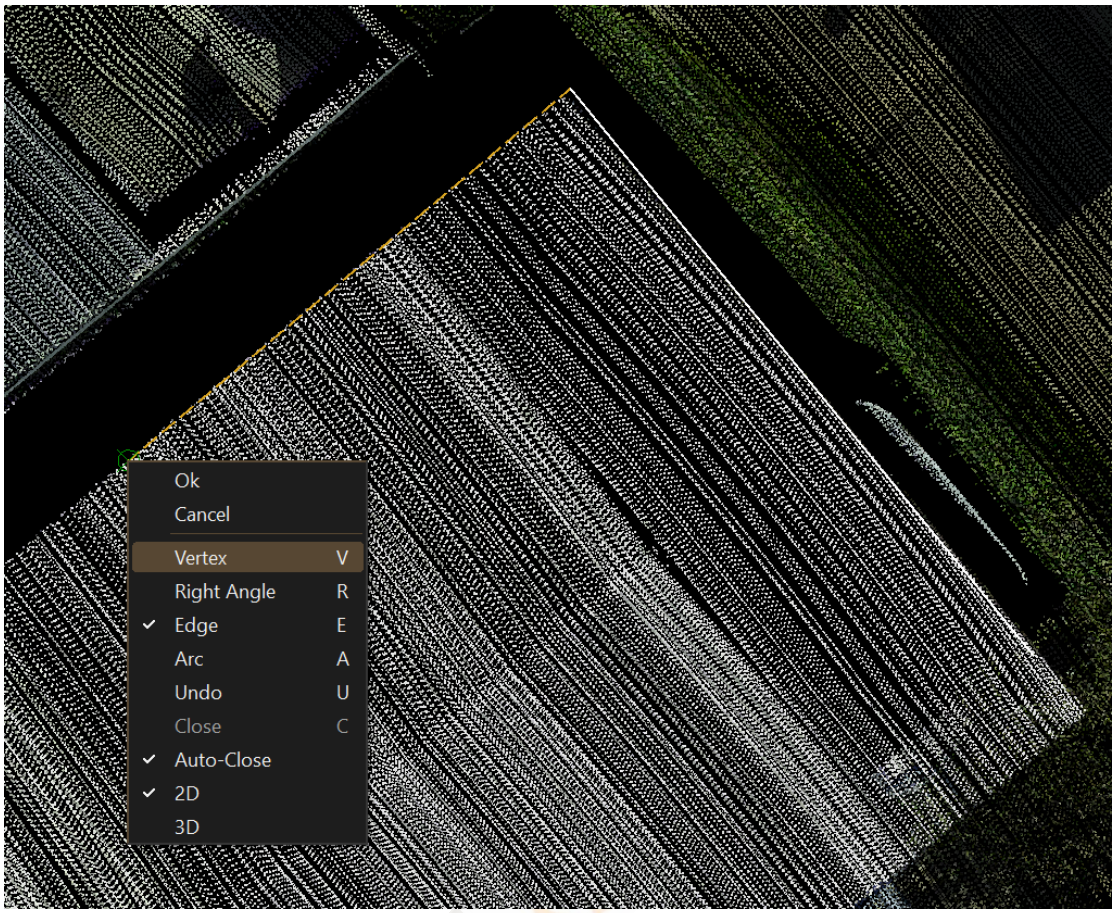


Figure: Right-Click Menu in Edge Mode

Note:

1. **Check "Auto-Close": The last edge is closed by intersecting with the first edge. If the first edge is exactly parallel to the last edge, the first and last points are connected to close.**
2. **Uncheck "Auto-Close": Use the shortcut key C or right-click "Close" to close b y directly connecting the first and last points.**

2.4.2.2.4 Arc Mode

Function Description:

Draw a polyline in the drawing by drawing three points to determine an arc.

Operation Steps:

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

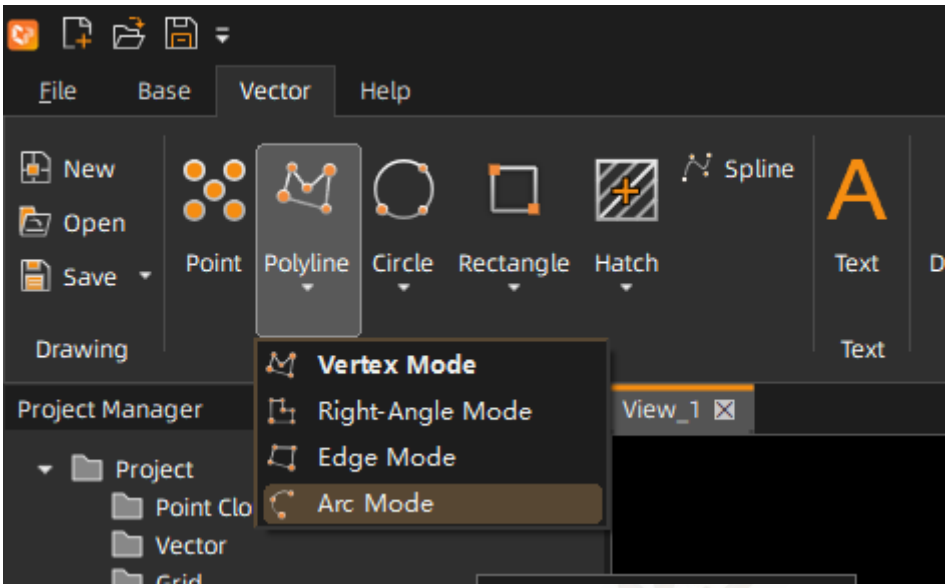


Figure: Arc Mode

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

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

④ In the view, click a point to determine the direction and size of the arc. Continue drawing as needed, with the end point of the previous arc as the start point.

⑤ In the view, press Enter to end, or right-click and select "Ok" to complete the polyline drawing. The default polyline is not closed. To draw a closed polyline, right-click "Close" to end the drawing, or right-click and check "Auto-Close" to close the polyline.

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

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". The start and end points of the arc can be drawn to the mouse snap position. In this case, the drawn arc is not a true arc but a 3D polyline composed of multiple line segments forming an

arc shape. The elevation of the middle arc part is interpolated from the elevations of the start and end points of the arc.

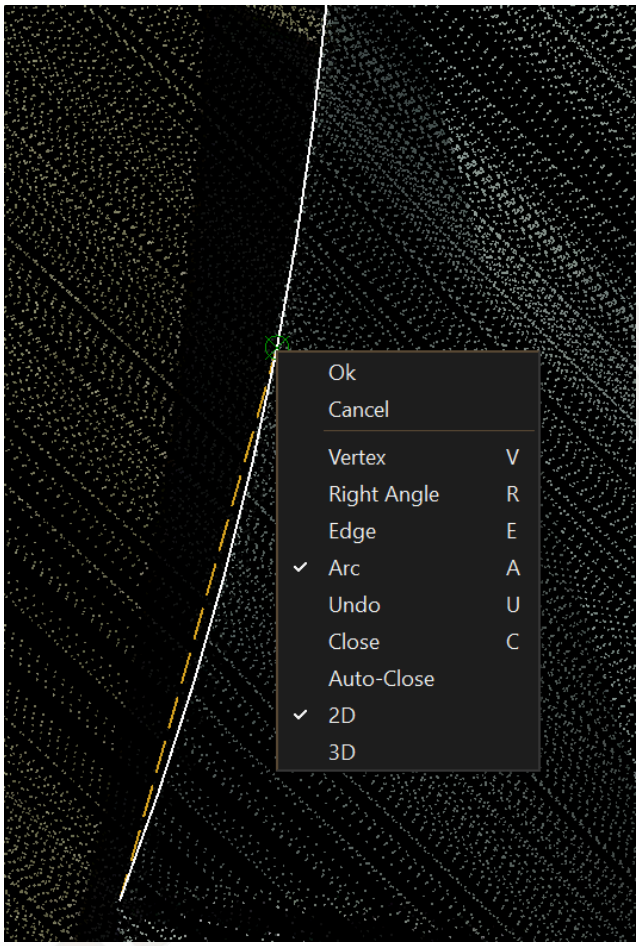


Figure: Right-Click Menu in Arc Mode

2.4.2.2.5 Drawing Mode Switch

The polyline drawing process supports switching between different interaction modes to continue drawing. The following details the switching effects between the four modes: "Vertex Mode, Right Angle Mode, Edge Mode, Arc Mode".

Vertex to Right Angle:

If switching to Right Angle Mode after drawing one point in Vertex Mode, the first point is used as the first point of the first edge in Right Angle Mode, and drawing can continue in Right Angle Mode. If switching to Right Angle Mode after drawing t

wo or more points in Vertex Mode, a perpendicular line is drawn through the last ver tex, and this perpendicular line is used as the first edge in Right Angle Mode, and dr awing can continue in Right Angle Mode.

Check "Auto-Close": The first vertex is closed by drawing a perpendicular line to th e last edge.

Uncheck "Auto-Close": All resulting edges are retained. If using the shortcut key C or right-click "Close", the first and last points are directly connected to close.

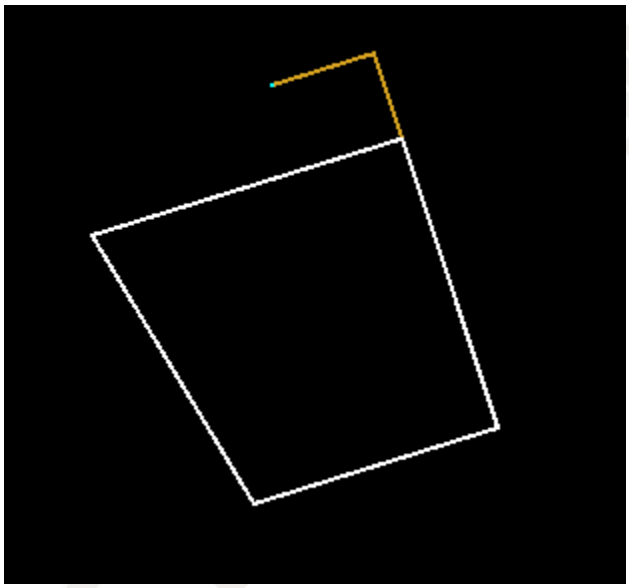


Figure: Vertex to Right Angle - Auto-Close Checked

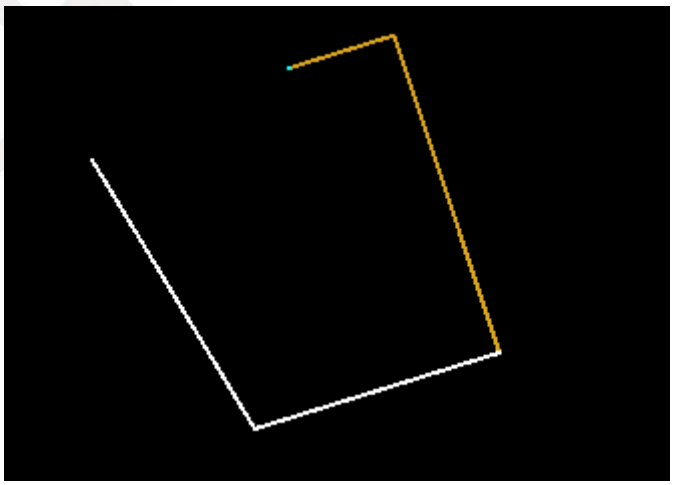


Figure: Vertex to Right Angle - Auto-Close Unchecked

Vertex to Edge:

When switching to Edge Mode during Vertex Mode drawing, the last point is used as the first point in Edge Mode, and drawing can continue in Edge Mode.

Check "Auto-Close": When the last edge is determined by two mouse clicks, the first and last points are connected to close; when the last edge is determined by one mouse click, the first point is closed by intersecting with the extension line of the last point and the tail edge.

Uncheck "Auto-Close": All edges are retained. If using the shortcut key C or right-click "Close", the first and last points are directly connected to close.

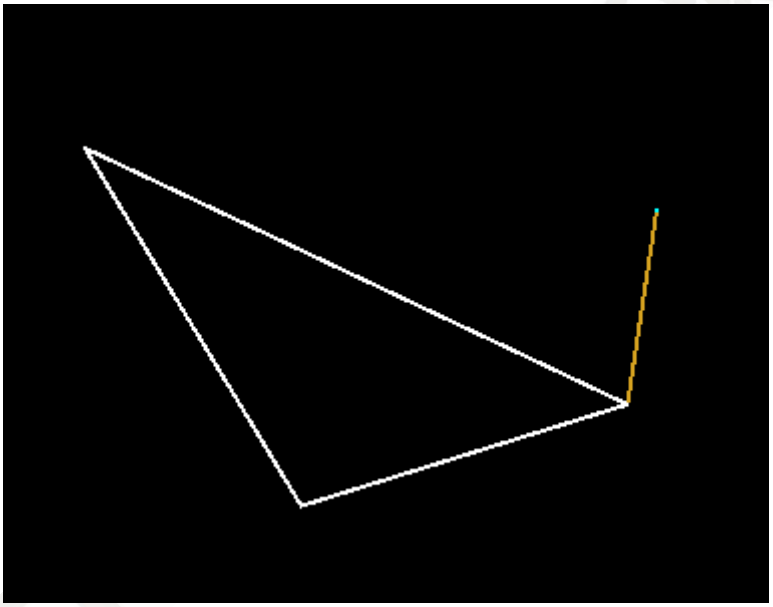


Figure: Vertex to Edge - Auto-Close Checked

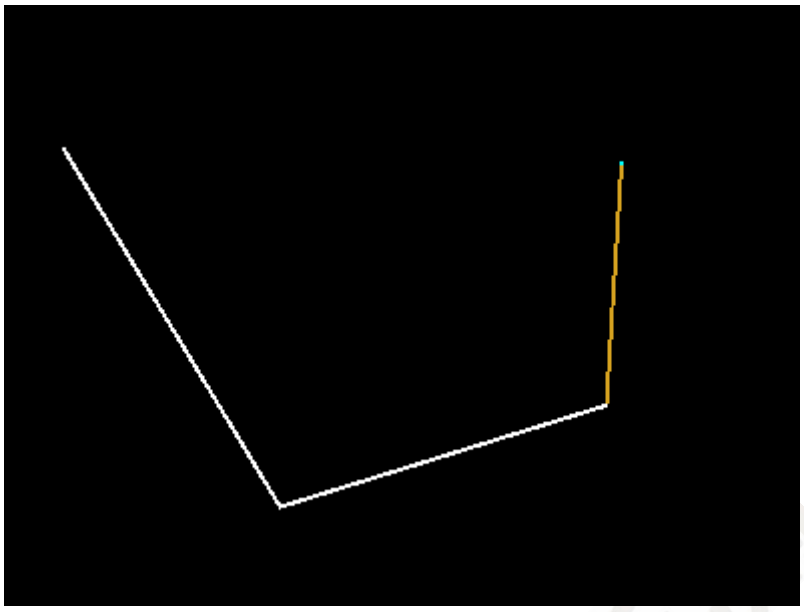


Figure: Vertex to Edge - Auto-Close Unchecked

Vertex to Arc:

When switching to Arc Mode during Vertex Mode drawing, the last point is used as the arc start point, and drawing can continue in Arc Mode.

Check "Auto-Close": The first vertex is connected to the last arc end point to close. **Uncheck "Auto-Close":** All edges and confirmed arcs are retained. If using the shortc ut key C or right-click "Close", the first and last points are directly connected to clos e

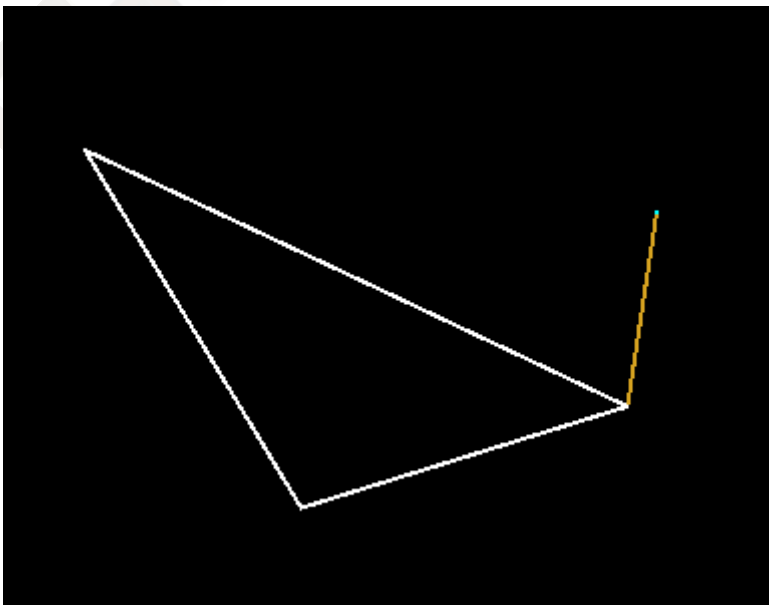


Figure: Vertex to Arc - Auto-Close Checked

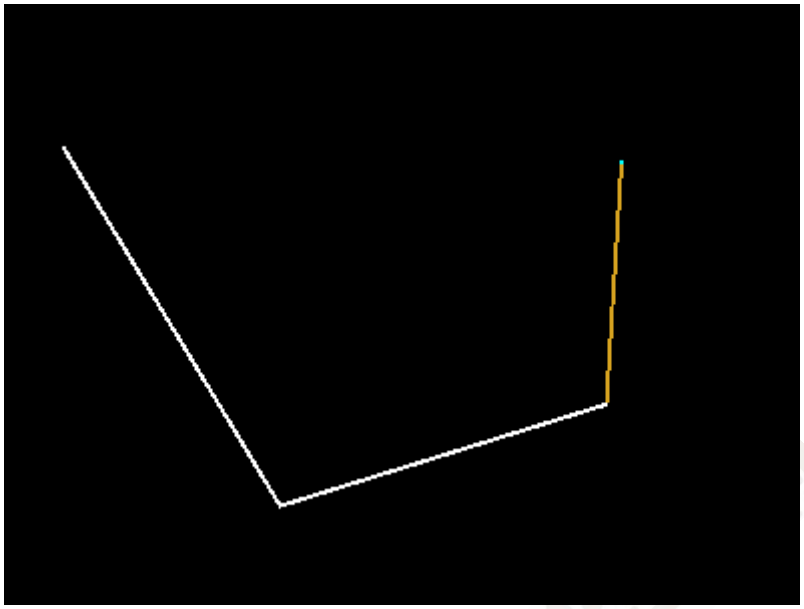


Figure: Vertex to Arc - Auto-Close Unchecked

Right Angle to Vertex:

If switching to Vertex Mode after drawing one point in Right Angle Mode, the drawn vectors are cleared. If switching to Vertex Mode after drawing two or more points in Right Angle Mode, all edges are retained, the first drawn point is projected onto the last edge, and drawing can continue in Vertex Mode.

Check "Auto-Close": The first and last points are connected to close.

Uncheck "Auto-Close": All edges are retained. If using the shortcut key C or right-click "Close", the first and last points are directly connected to close.

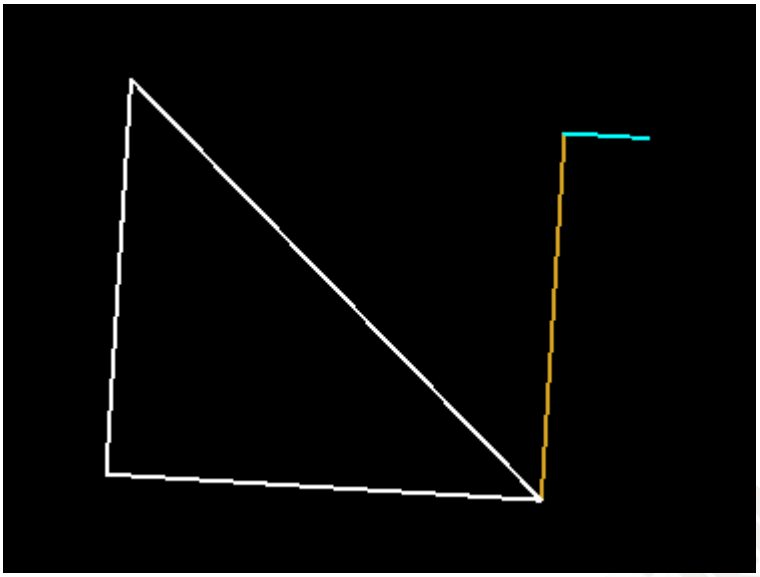


Figure: Right Angle to Vertex - Auto-Close Checked

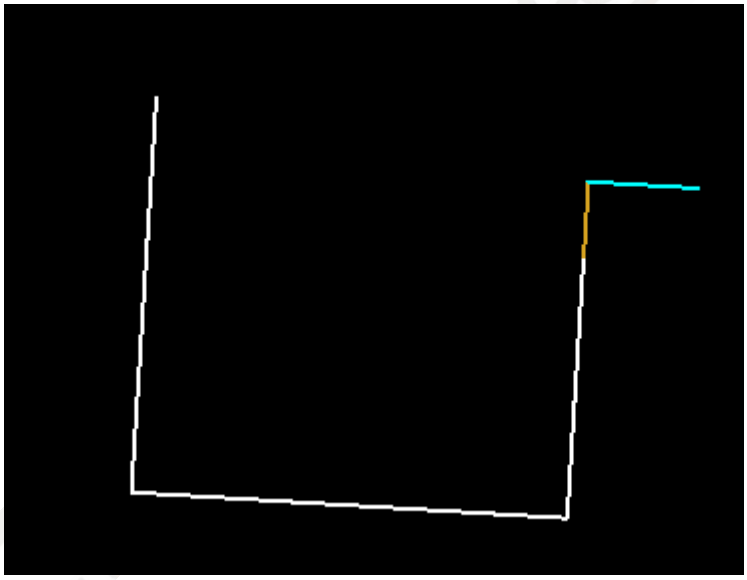


Figure: Right Angle to Vertex - Auto-Close Unchecked

Right Angle to Edge:

If switching to Edge Mode after drawing one point in Right Angle Mode, the first point is retained as the first point in Edge Mode for continued drawing. If switching to Edge Mode after drawing two or more points in Right Angle Mode, all edges determined by two points are retained, and drawing can continue in Edge Mode.

Check "Auto-Close": The last edge is closed by intersecting with the first and last e dges. If the first edge is exactly parallel to the last edge, the first and last points are connected to close.

Uncheck "Auto-Close": All edges are retained. If using the shortcut key C or right-cl ick "Close", the first and last points are directly connected to close.

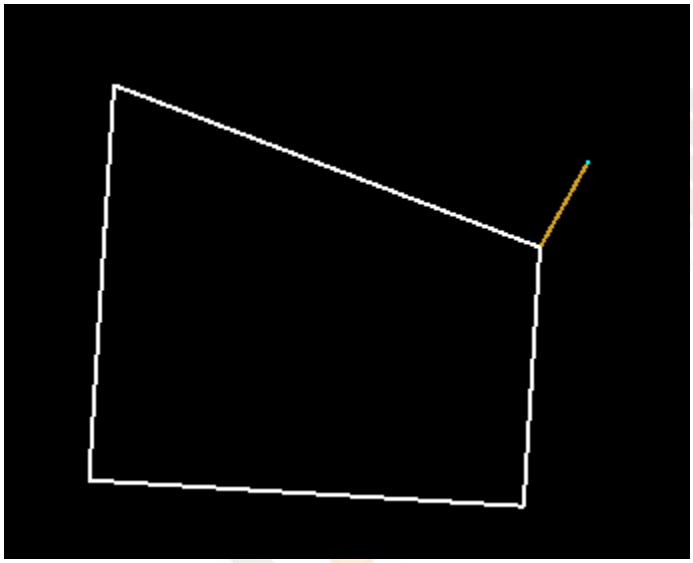


Figure: Right Angle to Edge - Auto-Close Checked

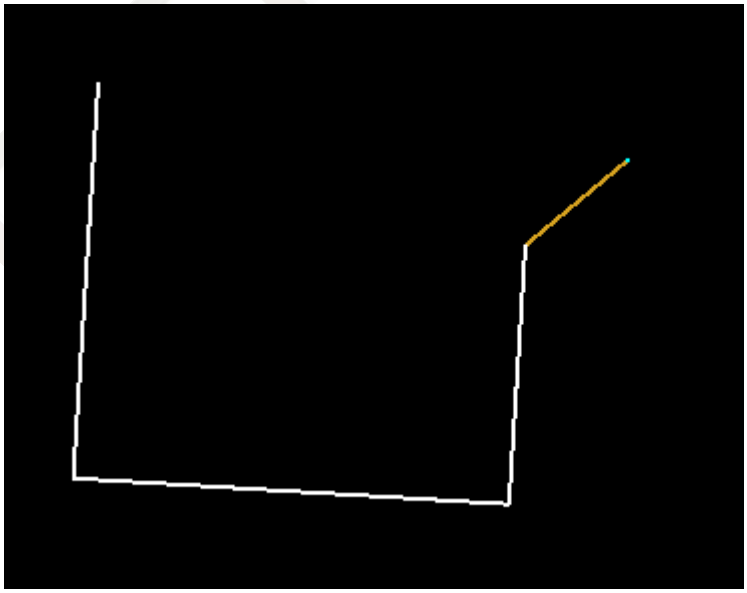


Figure: Right Angle to Edge - Auto-Close Unchecked

Right Angle to Arc:

If switching to Arc Mode after drawing one point in Right Angle Mode, the drawn v ectors are cleared. If switching to Arc Mode after drawing two or more points in Rig ht Angle Mode, all edges are retained, the first drawn point is projected onto the last edge as the arc start point, and drawing can continue in Arc Mode.

Check "Auto-Close": The first point is connected to the last arc end point to close.

Uncheck "Auto-Close": All edges and confirmed arcs are retained. If using the short cut key C or right-click "Close", the first and last points are directly connected to clo se.

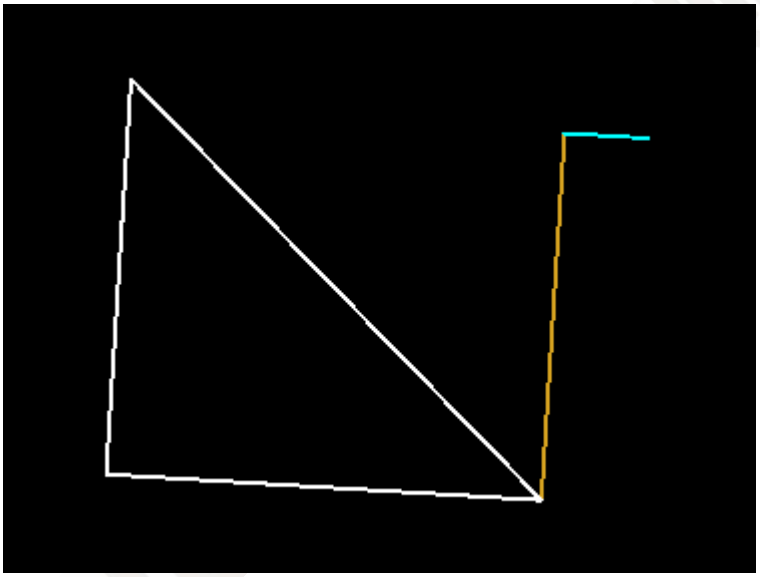


Figure: Right Angle to Arc - Auto-Close Checked

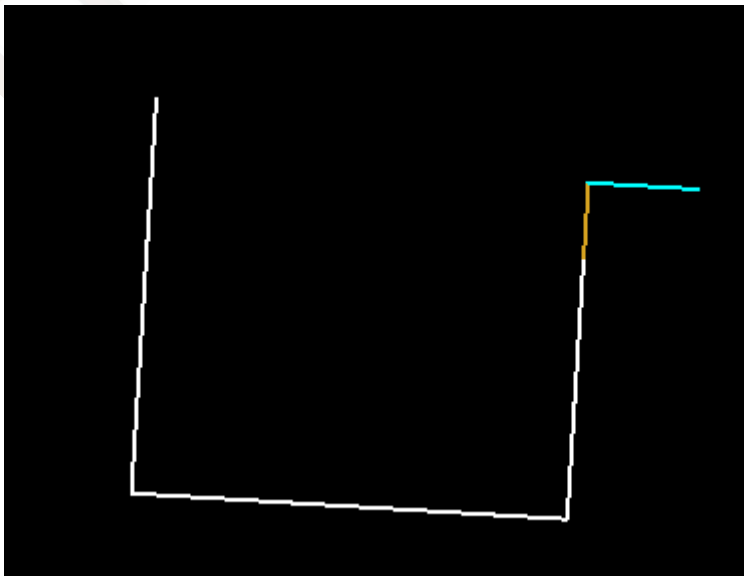


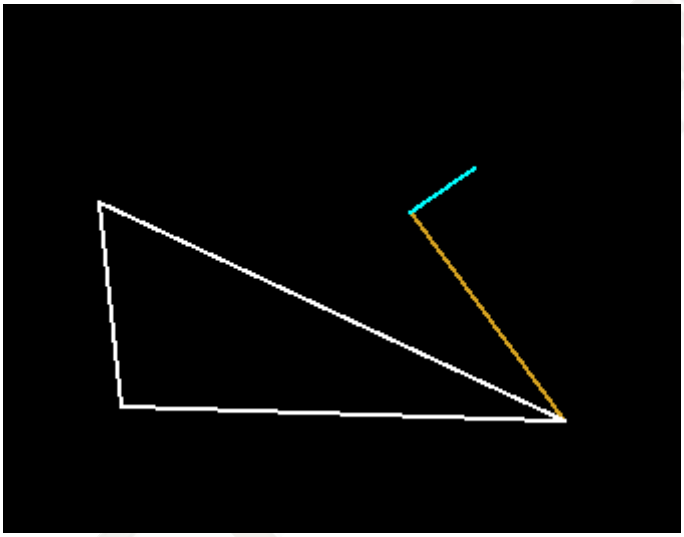
Figure: Right Angle to Arc - Auto-Close Unchecked

Edge to Vertex:

If switching to Vertex Mode after drawing one point in Edge Mode, the drawn vectors are cleared. If switching to Vertex Mode after drawing two or more points in Edge Mode, all edges determined by two points are retained, the first drawn point is projected onto the last edge, and drawing can continue in Vertex Mode.

Check "Auto-Close": The first and last points are connected to close.

Uncheck "Auto-Close": All edges are retained. If using the shortcut key C or right-click "Close", the first and last points are directly connected to close.



igure: Edge to Vertex - Auto-Close Checked

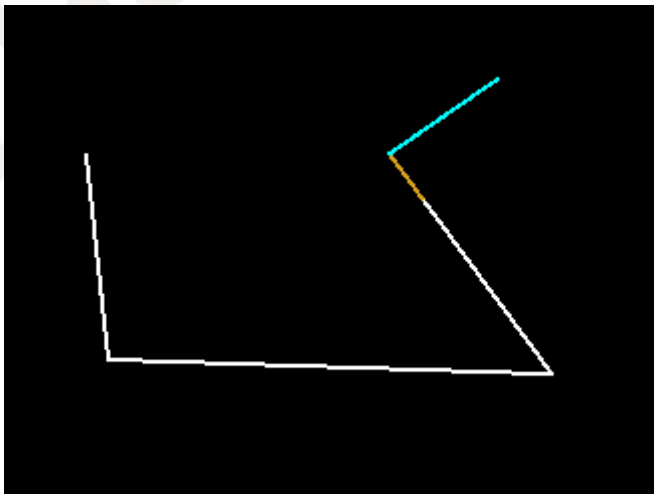


Figure: Edge to Vertex - Auto-Close Unchecked

Edge to Right Angle:

If switching to Right Angle Mode after drawing one point in Edge Mode, the first point is retained as the first point of the first edge in Right Angle Mode for continued drawing. If switching to Right Angle Mode after drawing two or more points in Edge Mode, all edges determined by two points are retained, and the last edge is used as the first edge in Right Angle Mode for continued drawing.

Check "Auto-Close": The first point is closed by drawing a perpendicular line to the last edge.

Uncheck "Auto-Close": All edges are retained. If using the shortcut key C or right-click "Close", the first and last points are directly connected to close.

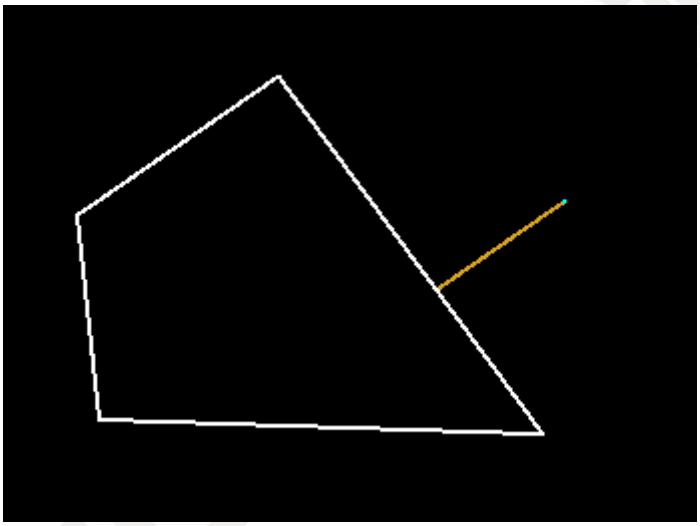


Figure: Edge to Right Angle - Auto-Close Checked

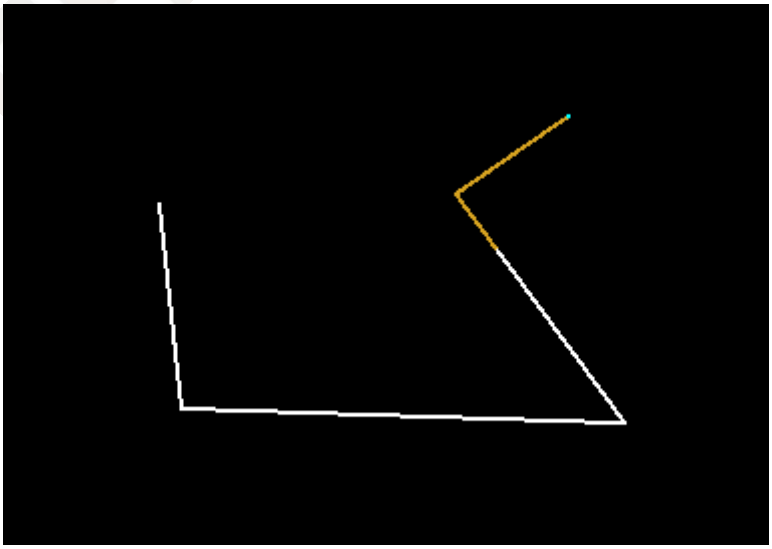


Figure: Edge to Right Angle - Auto-Close Unchecked

Edge to Arc:

If switching to Arc Mode after drawing one point in Edge Mode, the drawn vectors a re cleared. If switching to Arc Mode after drawing two or more points in Edge Mod e, all edges determined by two points are retained, the first drawn point is projected onto the last edge as the arc start point, and drawing can continue in Arc Mode.

Check "Auto-Close": The first point is connected to the last arc end point to close.

Uncheck "Auto-Close": All edges and confirmed arcs are retained. If using the short cut key C or right-click "Close", the first and last points are directly connected to clo se.

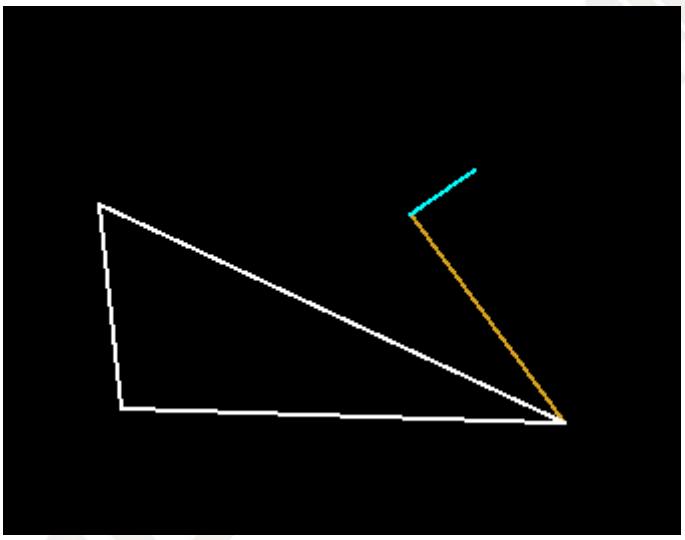


Figure: Edge to Arc - Auto-Close Checked

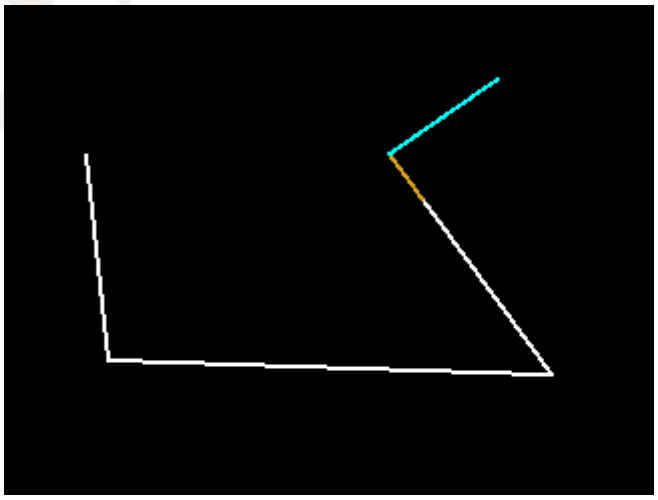


Figure: Edge to Arc - Auto-Close Unchecked

Arc to Vertex:

When switching to Vertex Mode during Arc Mode drawing, drawing continues along the end point of the confirmed arc, and the unconfirmed part of the arc is not retained.

Check "Auto-Close": The first and last points are connected to close.

Uncheck "Auto-Close": Confirmed arcs and all edges are retained. If using the shortcut key C or right-click "Close", the first and last points are directly connected to close.

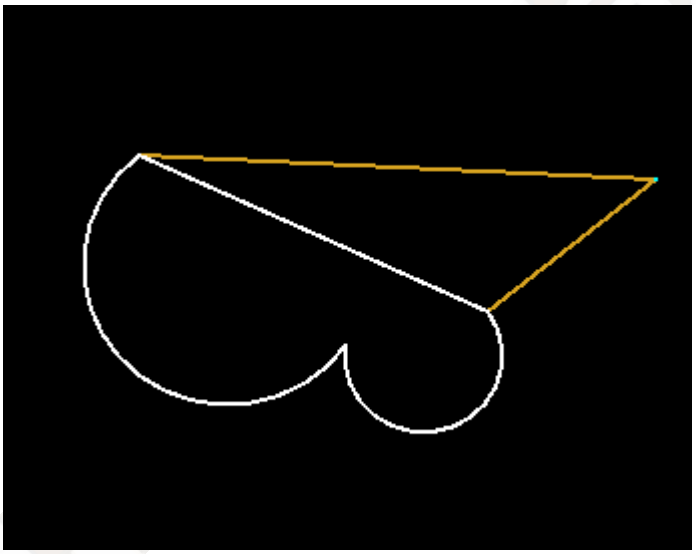


Figure: Arc to Vertex - Auto-Close Checked

Figure: Arc to Vertex - Auto-Close Unchecked

Arc to Right Angle:

When switching to Right Angle Mode during Arc Mode drawing, the end point of th e confirmed arc is directly used as the first point of the first edge in Right Angle M ode, and drawing can continue in Right Angle Mode. The unconfirmed part of the ar c is not retained.

Check "Auto-Close": The first point is closed by intersecting with the last edge.

Uncheck "Auto-Close": Confirmed arcs and all edges are retained. If using the shortc ut key C or right-click "Close", the first and last points are directly connected to clos e.

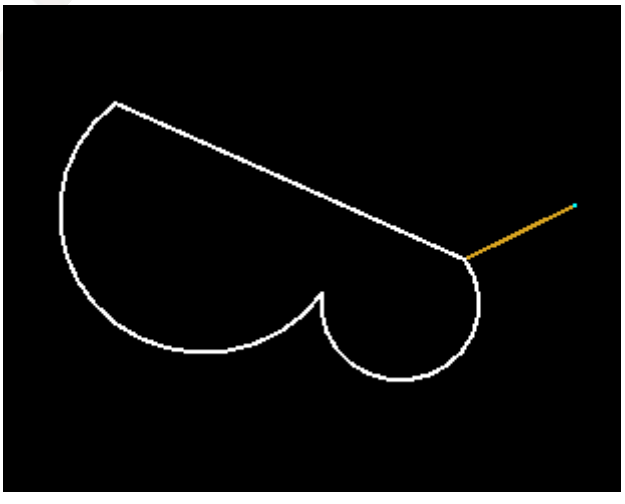


Figure: Arc to Right Angle - Auto-Close Checked

Figure: Arc to Right Angle - Auto-Close Unchecked

Arc to Edge:

When switching to Edge Mode during Arc Mode drawing, the end point of the confirmed arc is directly used as the first point in Edge Mode, and drawing can continue in Edge Mode. The unconfirmed part of the arc is not retained.

Check "Auto-Close": When the last edge is determined by two mouse clicks, the first and last points are connected to close; when the last edge is determined by one mouse click, the first point is closed by intersecting with the extension line of the last point and the tail edge.

Uncheck "Auto-Close": Confirmed arcs and all edges are retained. If using the shortcut key C or right-click "Close", the first and last points are directly connected to close.

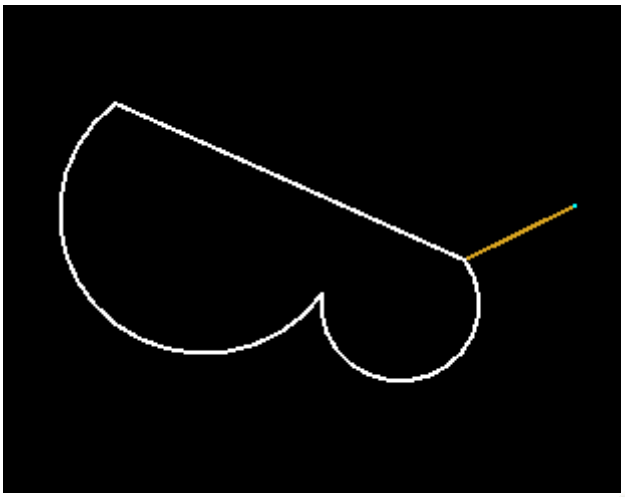


Figure: Arc to Edge - Auto-Close Checked

Figure: Arc to Edge - Auto-Close Unchecked

2.4.2.3 Circle

2.4.2.3.1 Three-Point Circle

Function Description:

Draw a circle by determining three points on the circumference in the drawing.

Operation Steps:

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

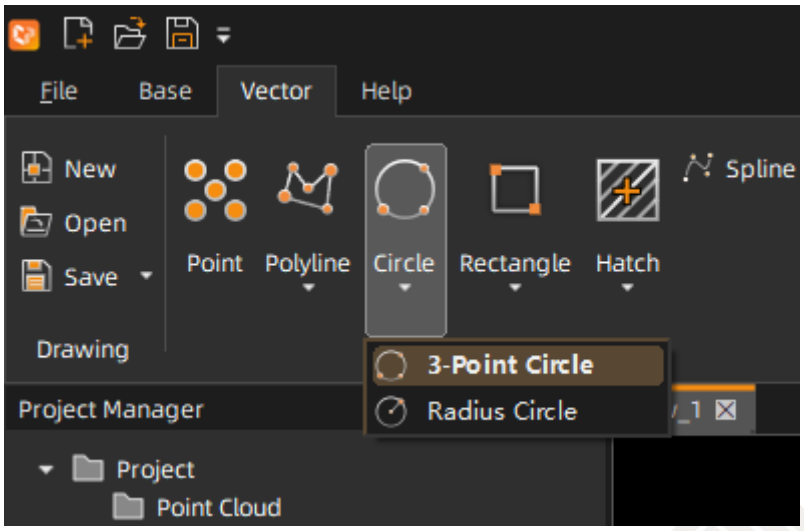


Figure: Three-Point Circle

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

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

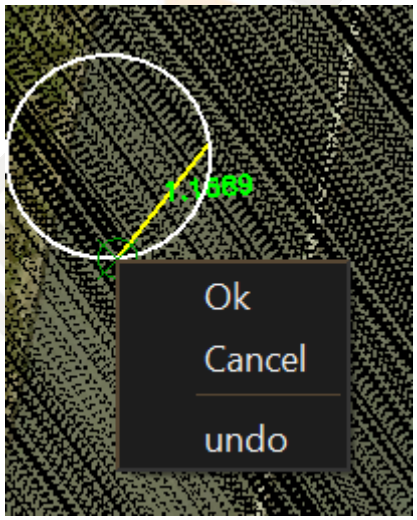


Figure: Right-Click Menu for Three-Point Circle

④ The default drawing mode is "2D Drawing". For a 2D-drawn circle, the plane is always parallel to the XY plane of the view, and the vector elevation is consistent with the elevation captured by the first point. Select "3D Drawing", and the reference plane of the drawn circle is determined by the three points clicked during drawing.

⑤ Right-click to switch to "Radius Circle" drawing before performing three-points circle.

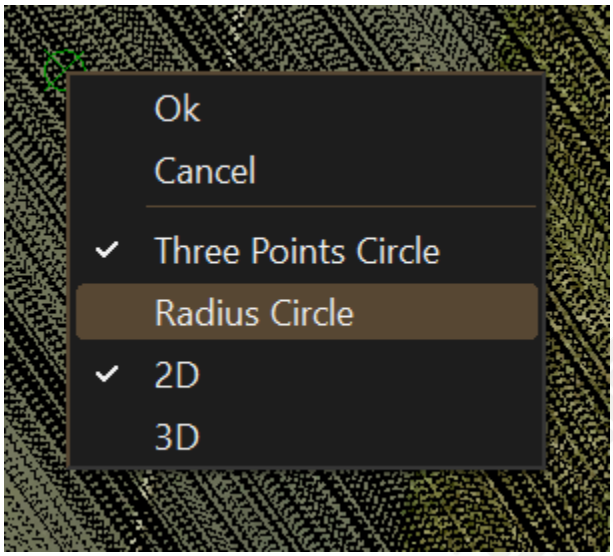


Figure: Right-Click Menu Before Drawing Three-Point Circle

2.4.2.3.2 Radius Circle

Function Description:

Draw a circle by determining the center and radius with two points in the drawing.

Operation Steps:

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

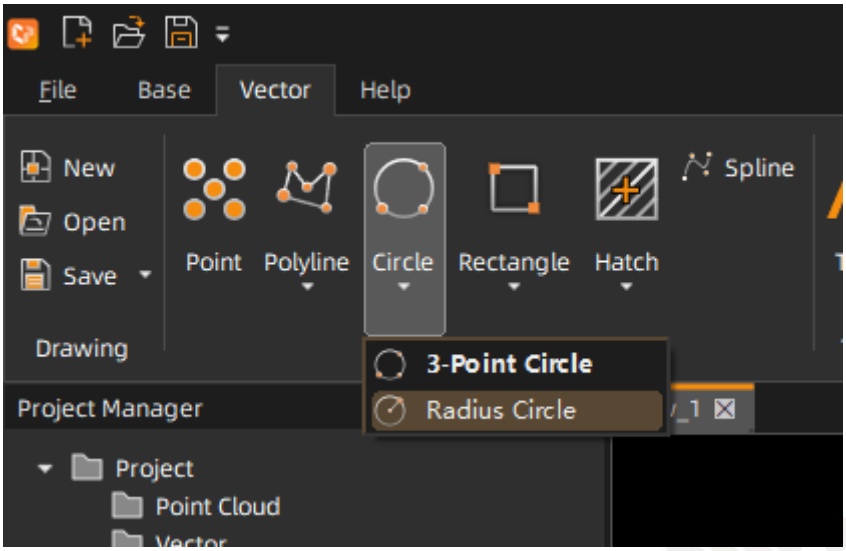


Figure: Radius Circle

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

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

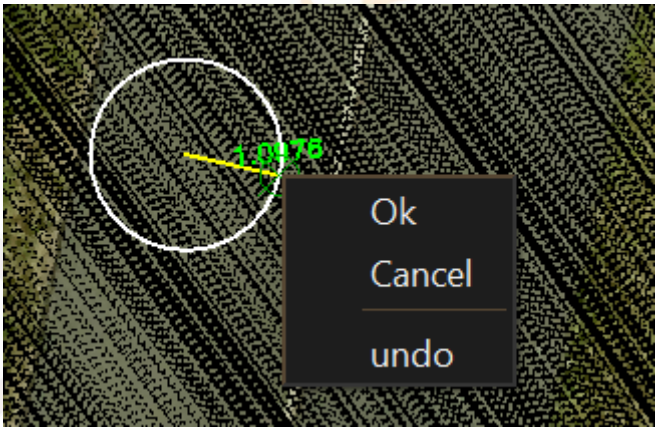


Figure: Right-Click Menu for Radius Circle

④ The default drawing mode is "2D Drawing". For a 2D-drawn circle, the plane is always parallel to the XY plane of the view, and the vector elevation is consistent with the elevation captured by the first point. Select "3D Drawing", and the drawn circle is consistent with the 2D-drawn one.

⑤ Right-click to switch to "Three-Point Circle" drawing before performing radius circle.

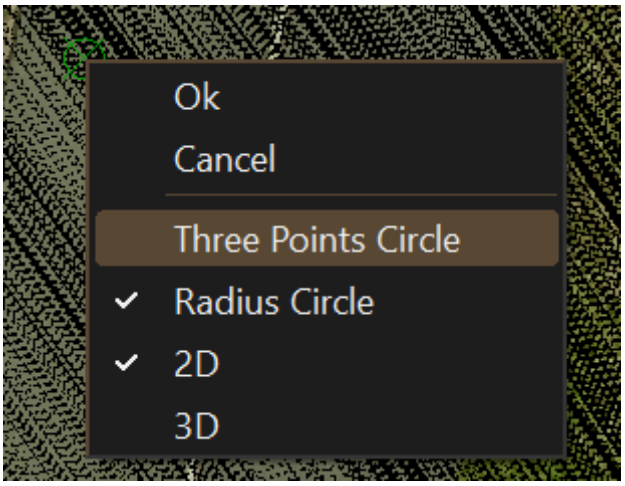


Figure: Right-Click Menu Before Drawing Radius Circle

2.4.2.4 Rectangle

2.4.2.4.1 Two-Point Rectangle

Function Description:

Draw a rectangle by clicking two points in the drawing.

Operation Steps:

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

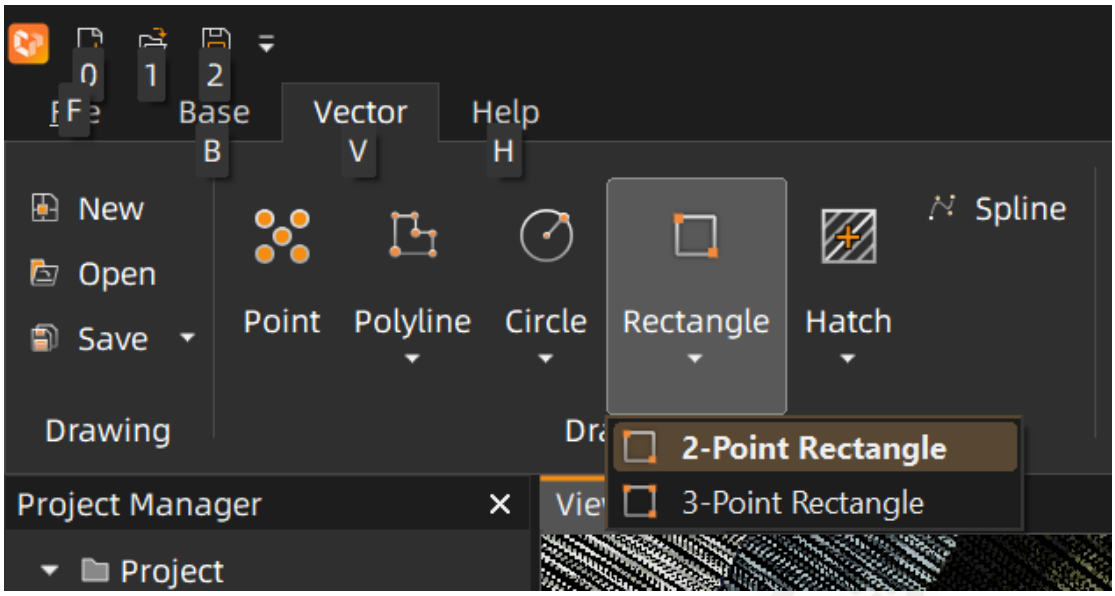


Figure: Two-Point Rectangle

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

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

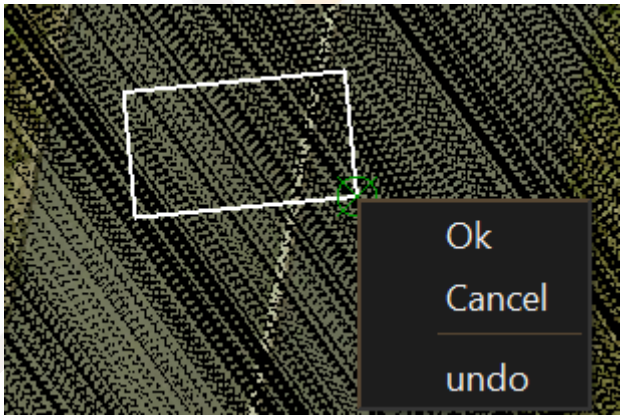


Figure: Right-Click Menu for Two-Point Rectangle

④ The default drawing mode is "2D Drawing". For a 2D-drawn rectangle, the plane is always parallel to the XY plane of the view, and the vector elevation is consis tent with the elevation captured by the first point. A "3D Drawing" rectangle is c onsistent with the 2D-drawn one.

⑤ Right-click to switch to "Three-Point Rectangle" drawing before performing two p oints rectangle.

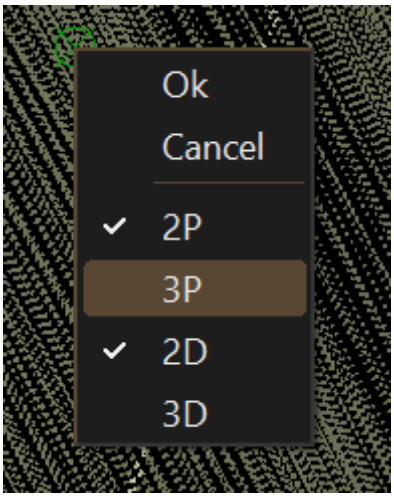


Figure: Right-Click Menu Before Drawing Two-Point Rectangle

2.4.2.4.2 Three-Point Rectangle

Function Description:

Draw a rectangle by clicking three points in the drawing.

Operation Steps:

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

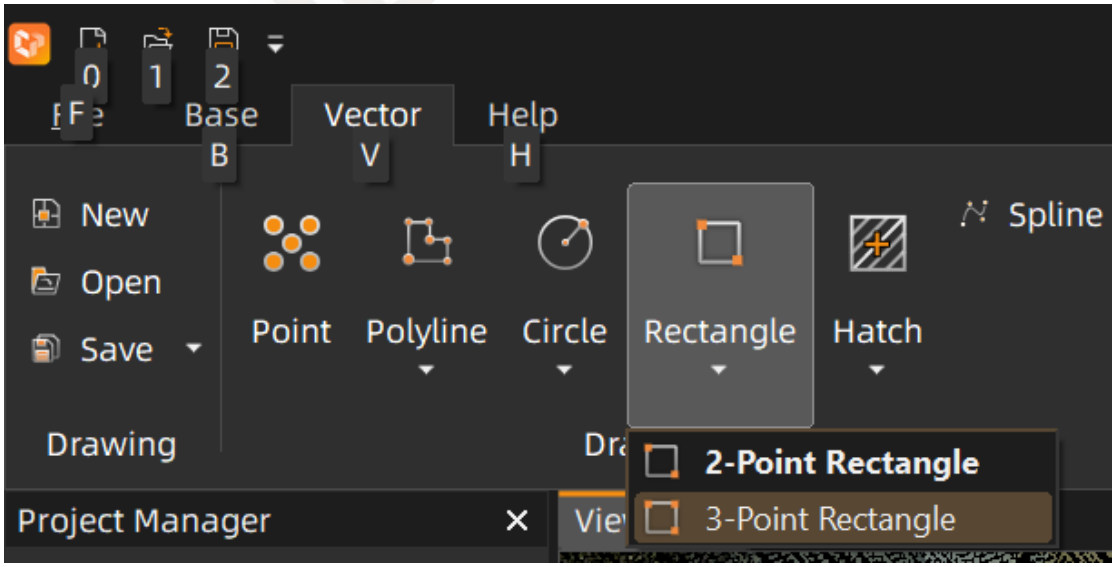


Figure: Three-Point Rectangle

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

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

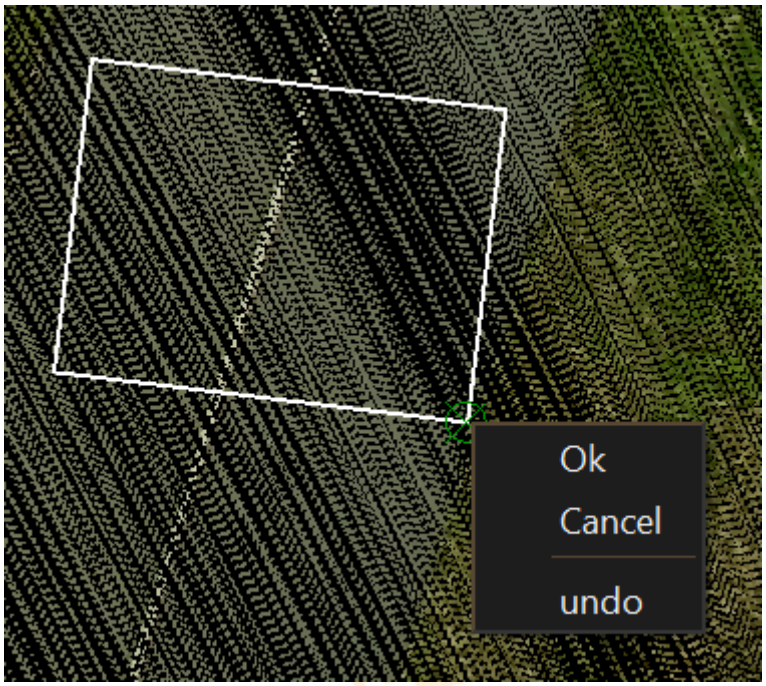


Figure: Right-Click Menu for Three-Point Rectangle

④ The default drawing mode is "2D Drawing". For a 2D-drawn rectangle, the plane is always parallel to the XY plane of the view, and the vector elevation is consis tent with the elevation captured by the first point. Select "3D Drawing", and the reference plane of the drawn rectangle is determined by the three points clicked during drawing.

⑤ Right-click to switch to "Two-Point Rectangle" drawing before performing three p oints rectangle.

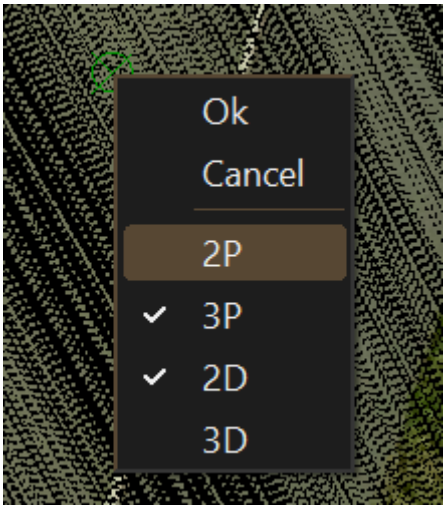


Figure: Right-Click Menu Before Drawing Three-Point Rectangle

2.4.2.5 Hatch

2.4.2.5.1 Pick Internal Point

Function Description:

Hatch a closed vector feature with a pattern by clicking inside the closed vector in th e drawing.

Operation Steps:

① Click Draw Vector -> Hatch -> Pick Internal Point. The "Create Hatch" panel po ps up on the right side of the software.

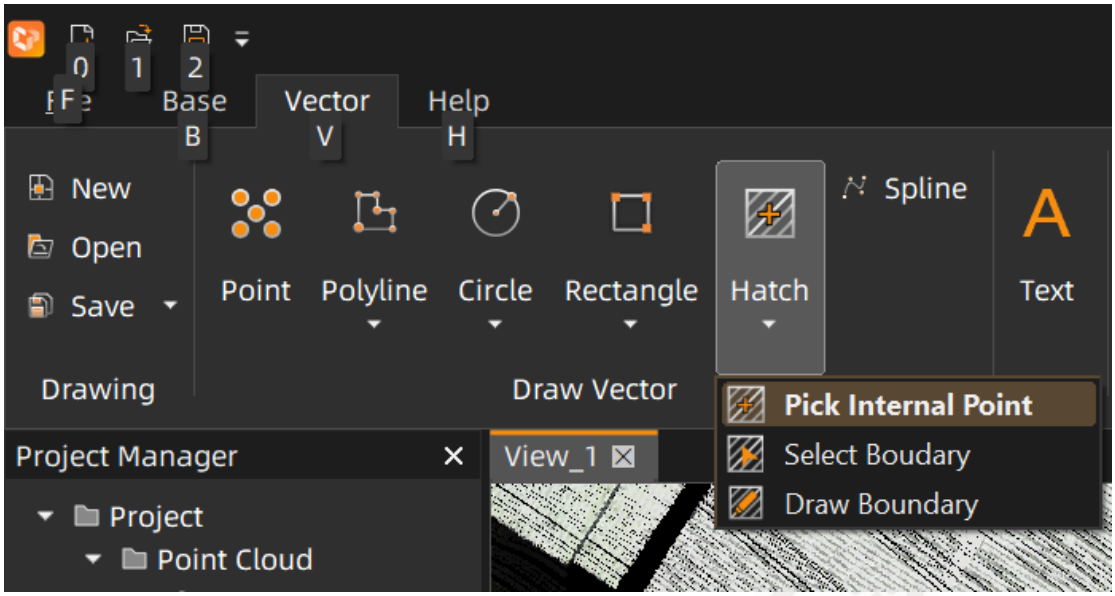


Figure: Pick Internal Point

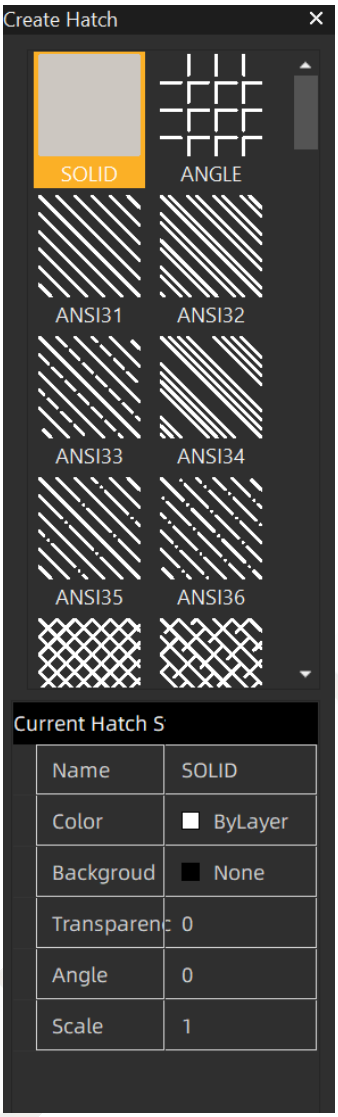


Figure: Create Hatch Panel

② Select the desired pattern style in the "Create Hatch" panel.

③ Left-click inside the closed vector to be filled. The inside of the vector will be filled with the specified pattern style.

The current hatch pattern can be edited in the "Create Hatch" panel. For specific instructions, refer to the "Edit Hatch" section.

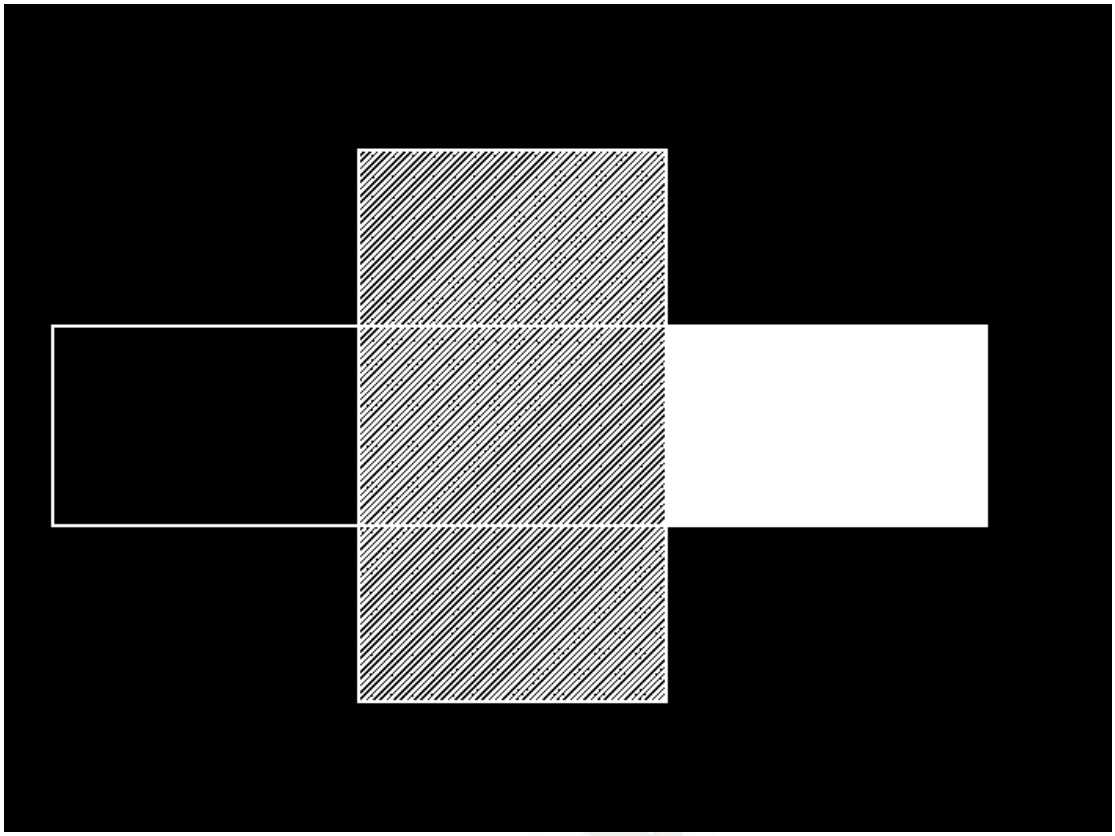


Figure: Hatch Result

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 editing and modifications will change the entire object.

2.4.2.5.2 Select Boundary

Function Description:

Hatch the closed area formed by multiple vector lines with a pattern by selecting them in the drawing.

Operation Steps:

① Click Draw Vector -> Hatch -> Select Boundary. The "Create Hatch" panel pops up on the right side of the software.

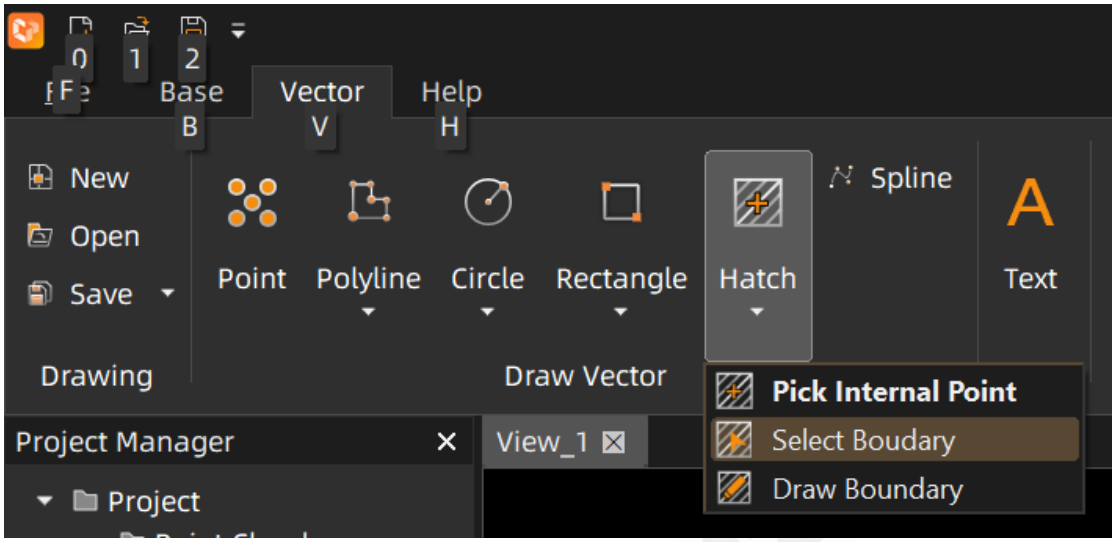


Figure: Select Boundary

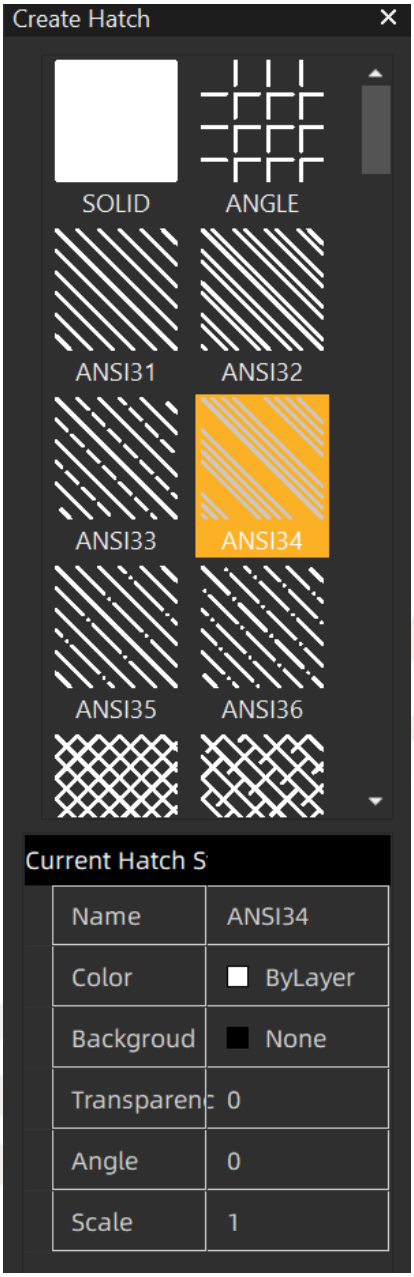


Figure: Create Hatch Panel

② Select the desired pattern style in the "Create Hatch" panel.

③ Left-click select the closed area then Right-click select "OK" to be filled. The ins ide of the vector will be filled with the specified pattern style.

The current hatch pattern can be edited in the "Create Hatch" panel. For specific instr uctions, refer to the "Edit Hatch" section.

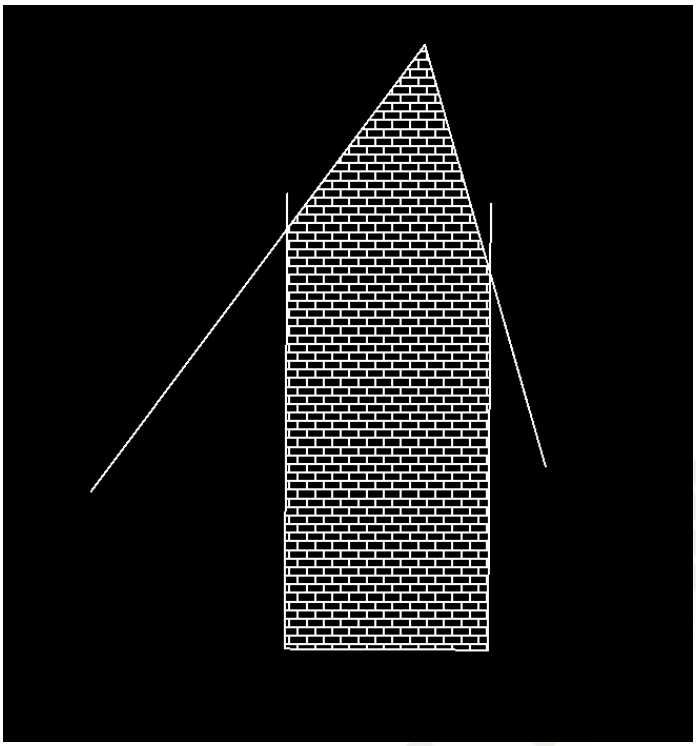


Figure: Hatch Result

2.4.2.5.3 Draw Boundary

Function Description:

Hatch the closed area formed by drawing vector line in the drawing.

Operation Steps:

① Click Draw Vector -> Hatch -> Draw Boundary. The "Create Hatch" panel pops up on the right side of the software.

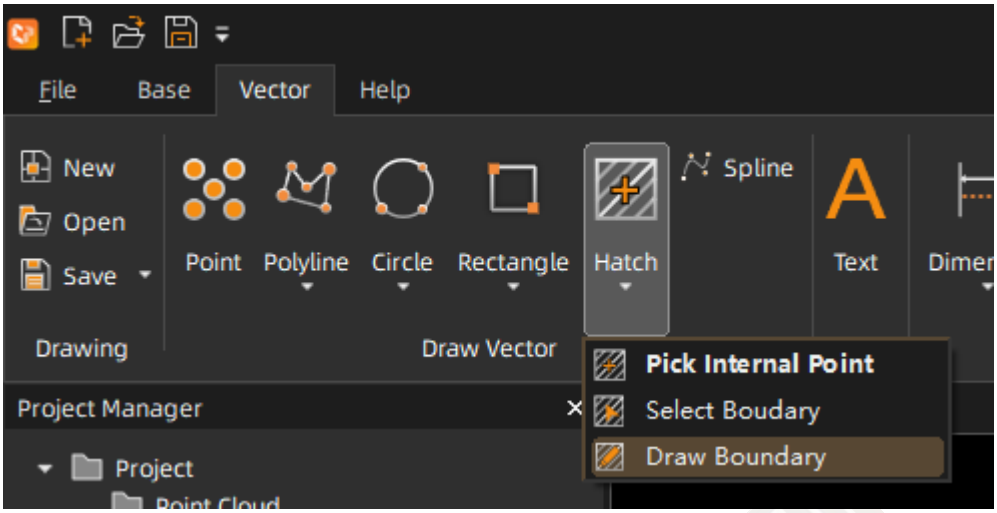


Figure: Draw Boundary

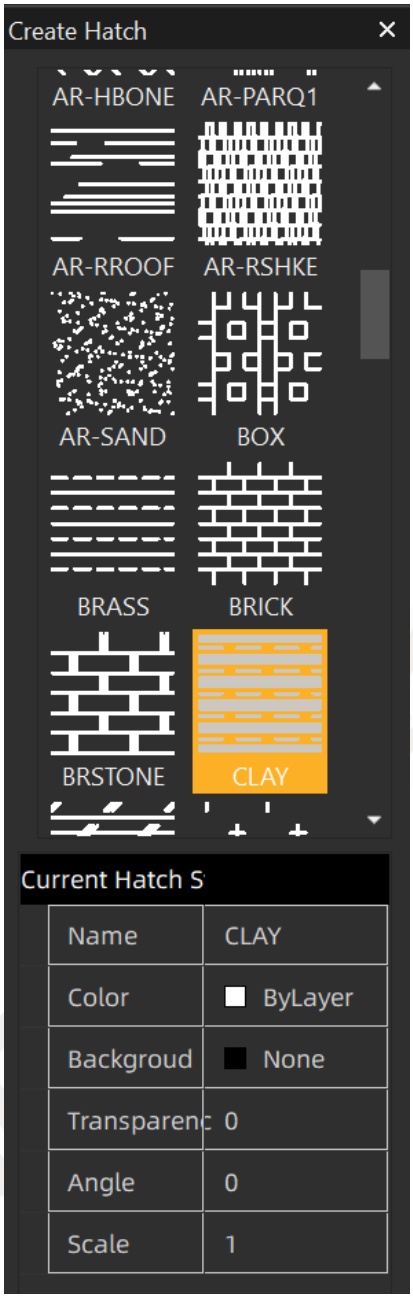


Figure: Create Hatch Panel

② Select the desired pattern style in the "Create Hatch" panel.

③ Directly draw a vector line, a closed vector will be generated. Press Enter to end, or right-click and select "Ok". The inside of the closed vector area will be filled with the specified pattern style.

The current fill pattern can be edited in the "Create Hatch" panel. For specific instructions, refer to the "Edit Hatch" section.

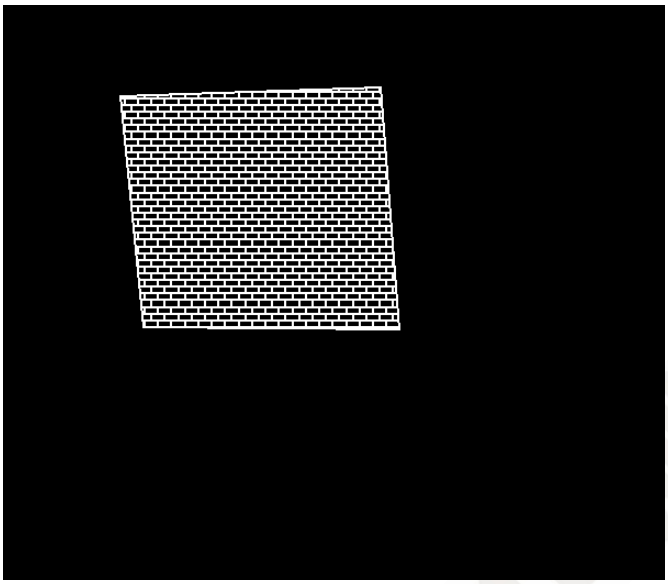


Figure: Hatch Result

Note:

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

2.4.2.6 Spline

Function Description:

Draw a spline curve in the drawing.

Operation Steps:

① Click Draw Vector -> Spline.

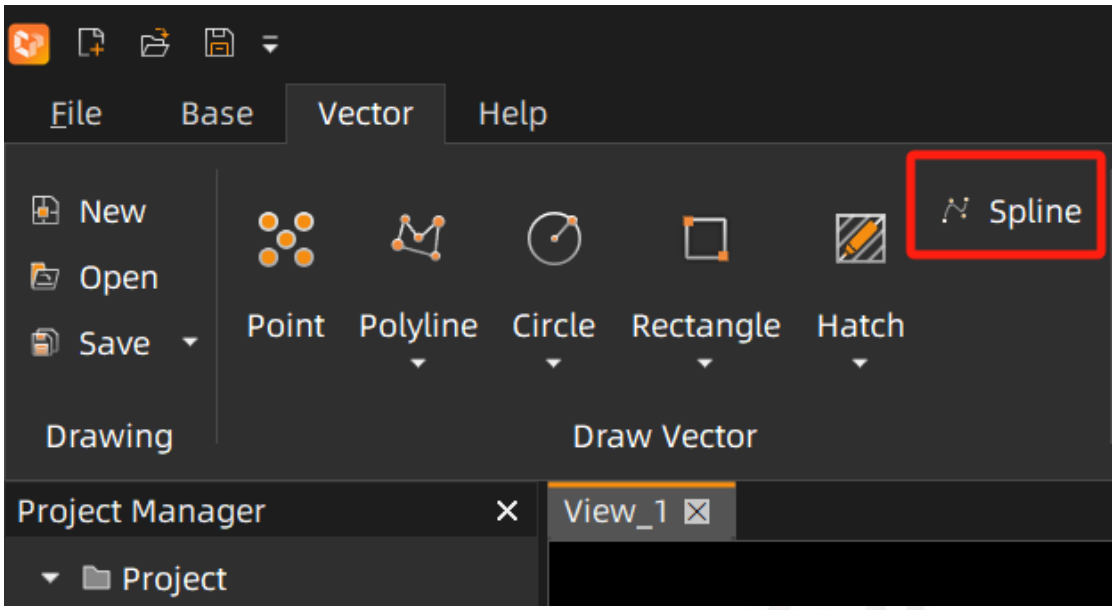


Figure: Spline Curve

② In the view window, specify the start point of the spline curve. Move the mouse, and a yellow guide line will appear.

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

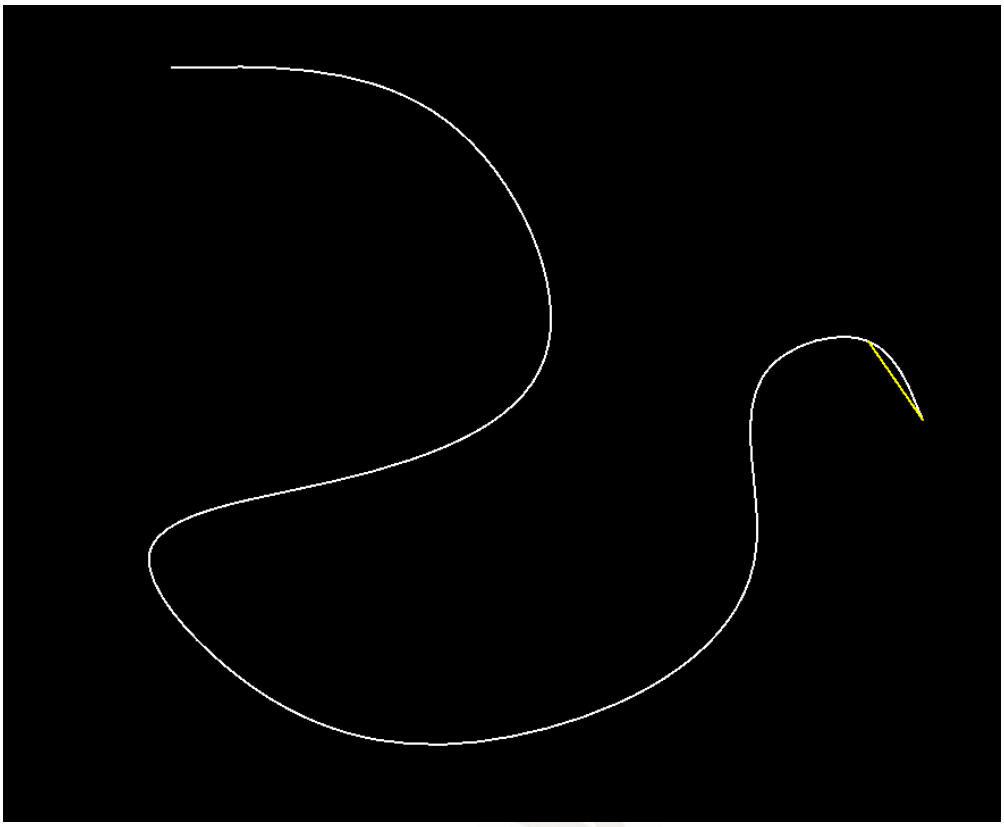


Figure: Effect of Drawing Spline Curve

④ In the view window, press Enter to end, or right-click and select "Ok" to comple te the spline curve drawing. The default spline curve is not closed. To draw a cl osed spline curve, right-click "Close" to end the drawing, and the spline curve wi ll be closed.

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

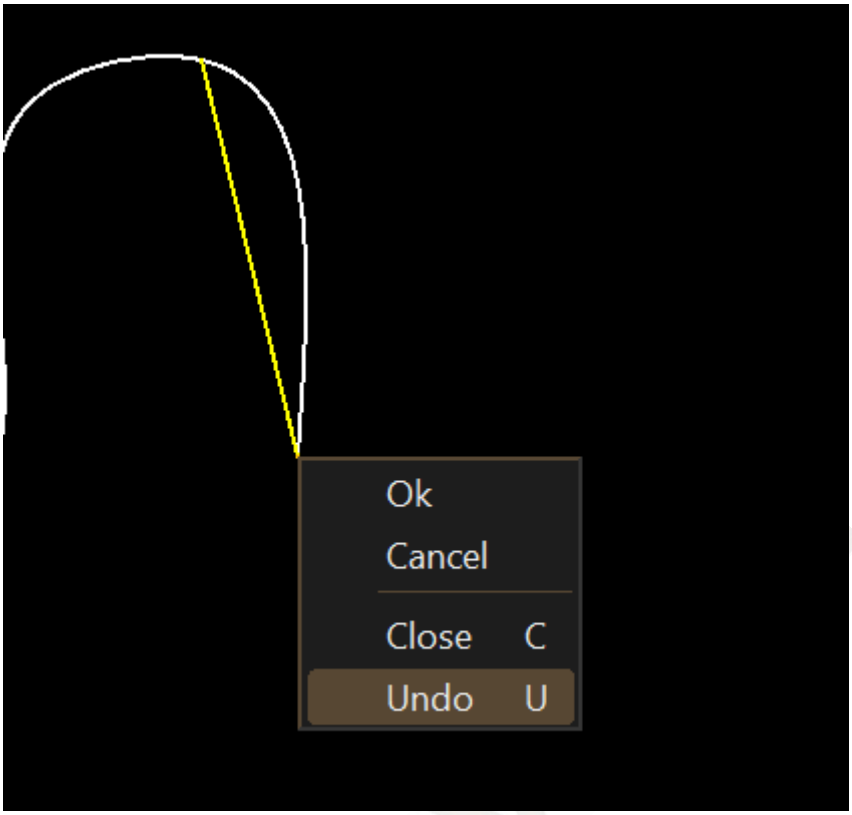


Figure: Right-Click Menu for Spline Curve

2.4.3 Text

Function Description:

Draw multiline text in the drawing.

Operation Steps:

① Click Text. A message is output: Please specify the insertion point of the text.

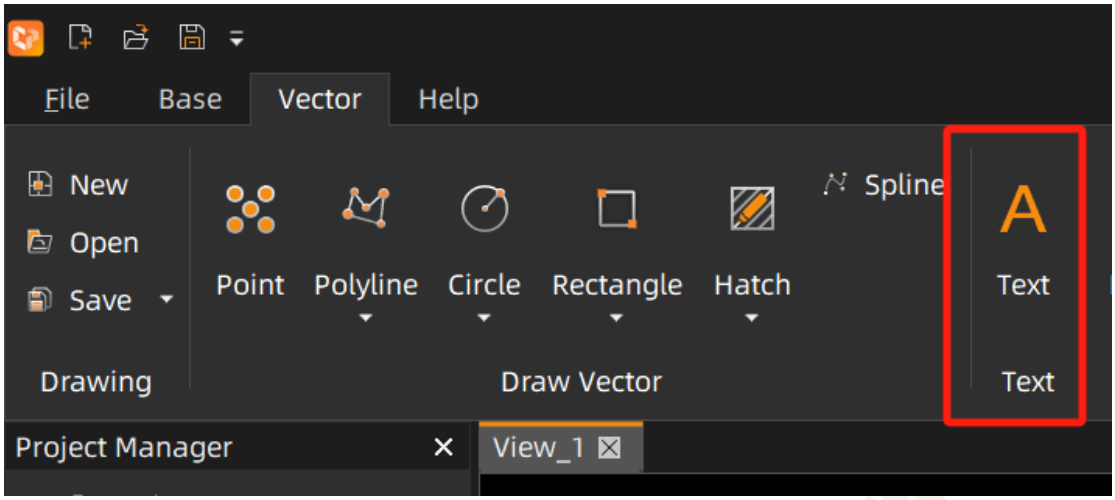


Figure: Text

② Click a point in the view. This point is the insertion point of the text, and the p lane where the text is located. A message is output: Please specify the direction o f the text. A preview effect "TEXT" is displayed, and the preview effect rotates with the mouse movement.

③ Click a second point in the view to determine the text direction. A message is o utput: Please specify the height of the text. The preview effect changes size with the mouse movement.

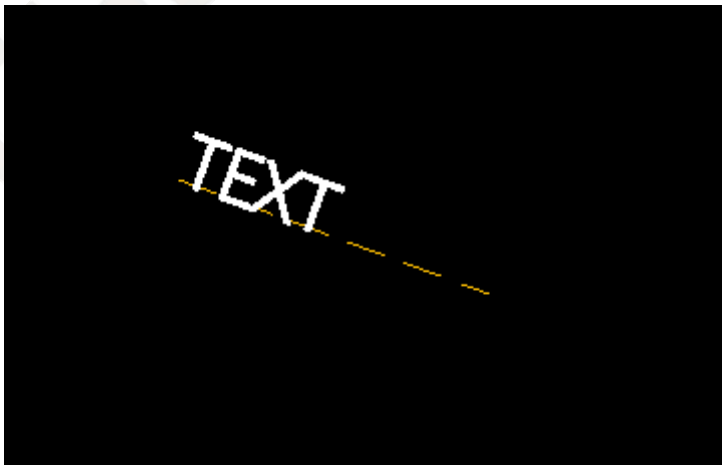


Figure: Preview Effect of Specifying Direction

④ Click a third point in the view to determine the text height. A "Text" dialog box pops up. Enter the content, click the "Ok" button, close the dialog box, submit th e result, and do not exit the function.

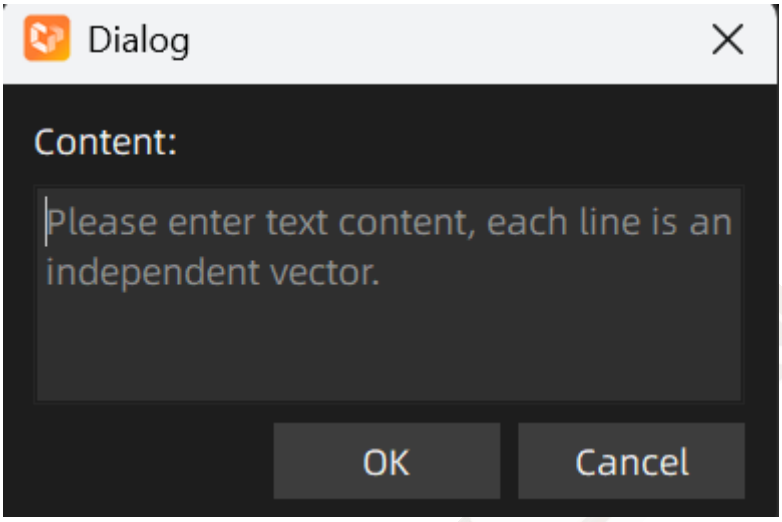


Figure: Text Input Dialog Box

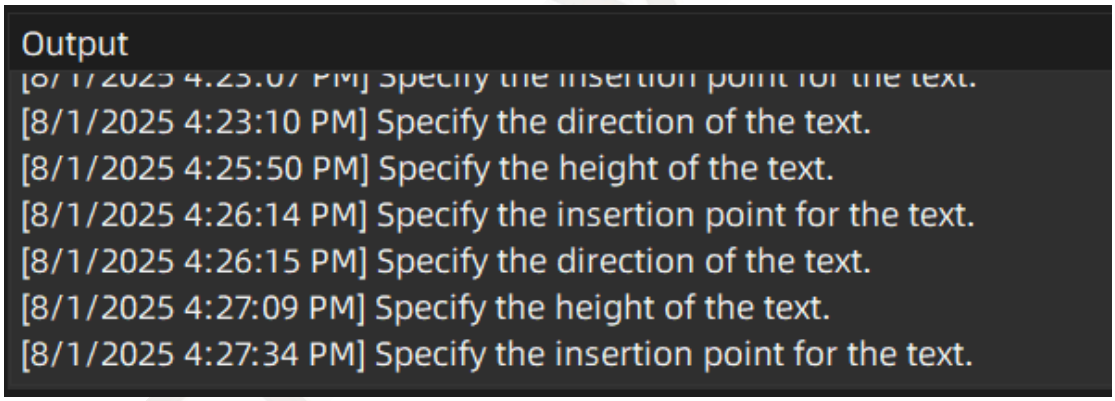


Figure: Text Output Message

⑤ In the view, left-click to continue creating text. Repeat the previous step. The ins ertion point of the text is the mouse click position, and the direction, alignment, a nd height are the same as before.

2.4.4 Mark

2.4.4.1 Aligned Dimension

Function Description:

Dimension point clouds, vectors, and models. The dimension results are saved in the current drawing, with two drawing modes: continuous drawing and single drawing.

Continuous Drawing Operation Steps:

① Click Vector -> Mark -> Aligned Dimension to activate aligned dimensioning.

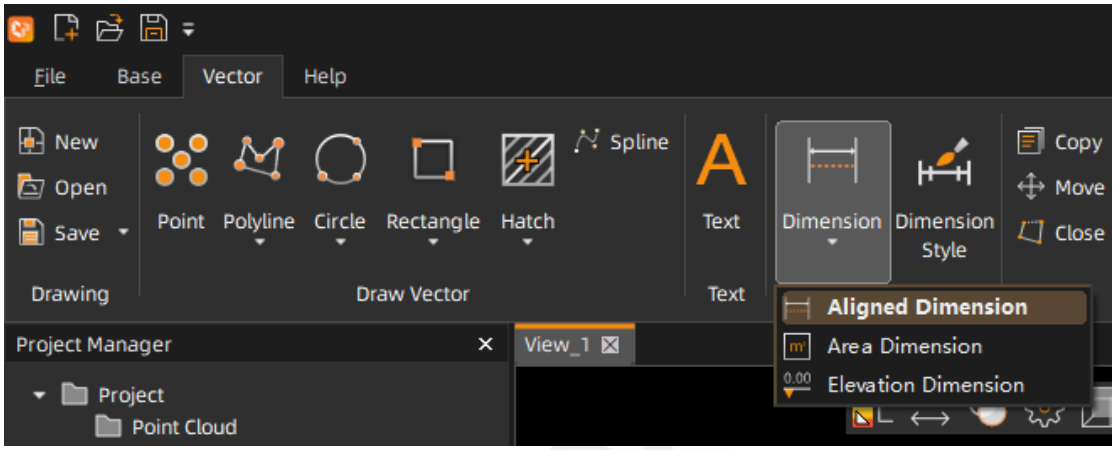


Figure: Aligned Dimension

② In the view, click a point as the start position of the aligned dimension. After cli cking, move the mouse position to display a preview effect for adjusting the leng th of the dimension line.

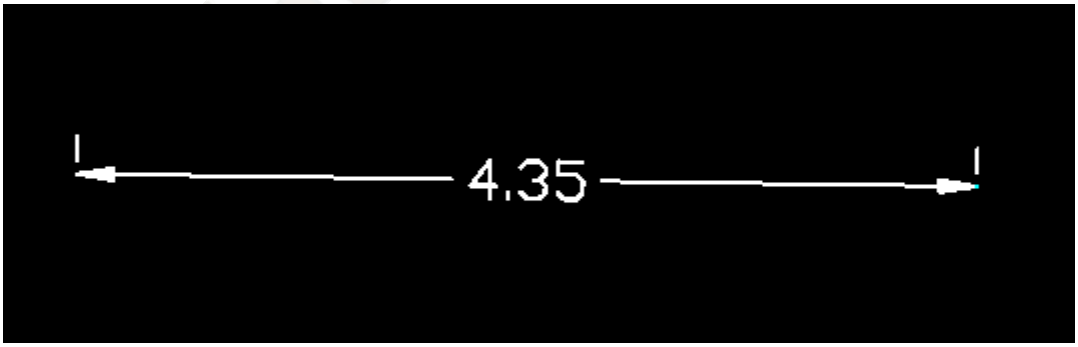


Figure: Start Point of Aligned Dimension

③ In the view, click a second point to determine the length and direction of the di mension line in the aligned dimension. After clicking, move the mouse position t o display a preview effect for adjusting the length of the extension line.

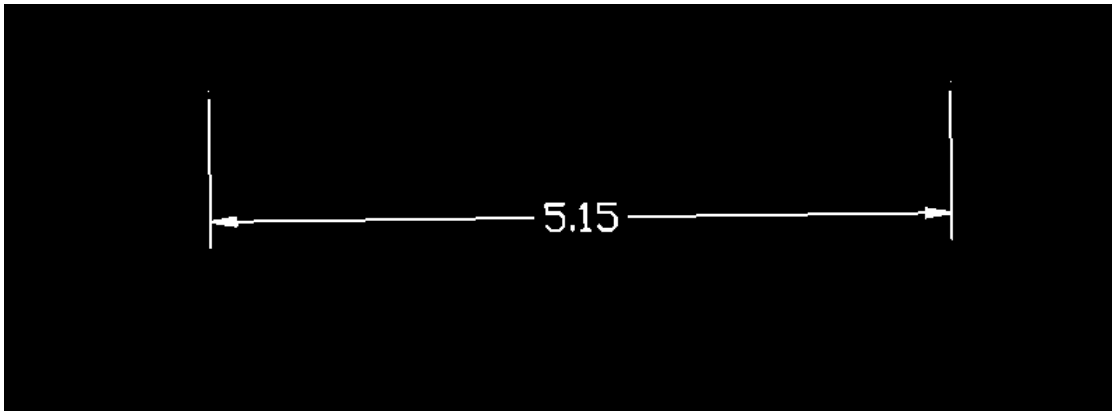


Figure: Adjusting Extension Line Length of Aligned Dimension

④ In the view, click a third point to determine the length of the extension line. The current aligned dimension drawing is completed. After clicking, move the mouse to display a preview effect of the next aligned dimension. The end point of the current aligned dimension is used as the start point of the next aligned dimensio n, and the dimension line direction and extension line length of the current aligne d dimension are retained until pressing Esc or activating another function to exit aligned dimension drawing, retaining the completed aligned dimension results.

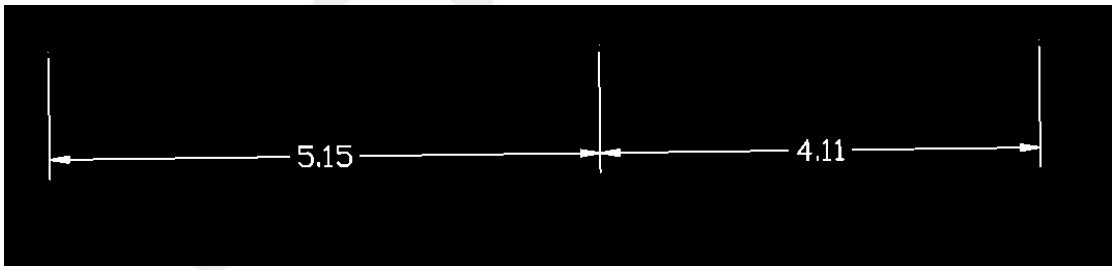


Figure: Continuously Drawing Aligned Dimensions

Single Drawing Operation Steps:

① Click Vector -> Mark -> Aligned Dimension to activate aligned dimensioning.

② In the view, right-click and click the "Single Drawing" option in the right-click menu to switch to single drawing of aligned dimensions.

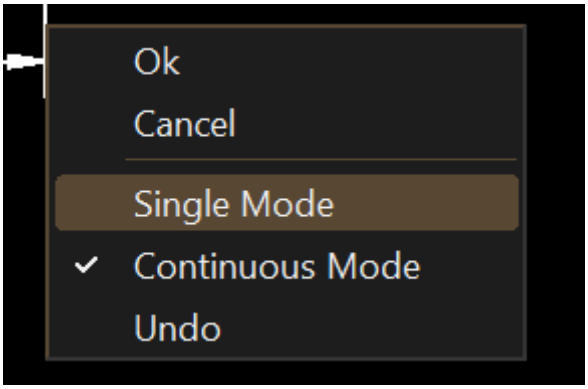


Figure: Switch to Single Aligned Dimension

③ In the view, sequentially select the start point, end point, and extension line lengt h of the aligned dimension to complete the single aligned dimension drawing.

④ In the view, continue left-clicking to start the next single aligned dimension draw ing.

2.4.4.2 Area Dimension

Function Description:

Dimension the area of a closed 2D area through three methods: picking an internal p oint, selecting boundary lines, and drawing boundary lines.

Picking Internal Point Operation Steps:

① Click Vector -> Mark -> Area Dimension to activate area dimensioning. A param eter panel appears on the right side of the software.

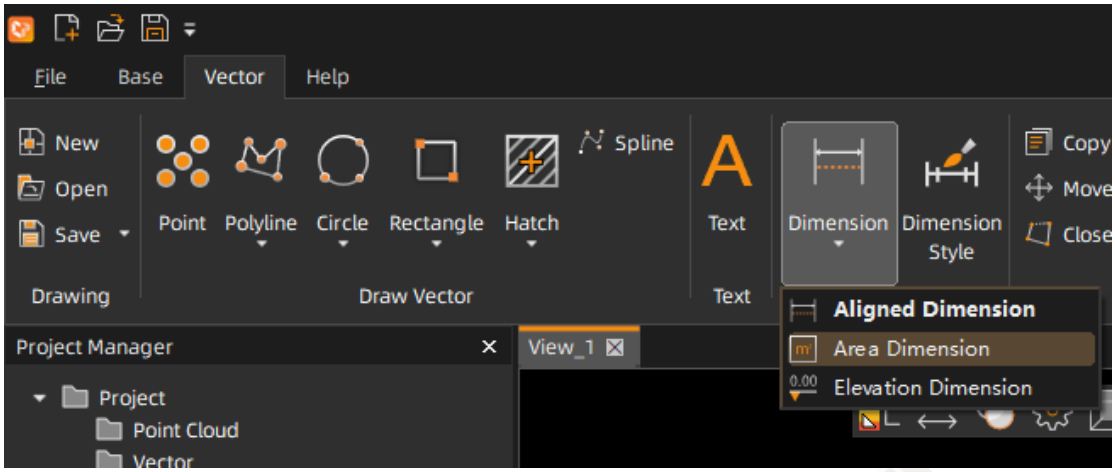


Figure: Area Dimension

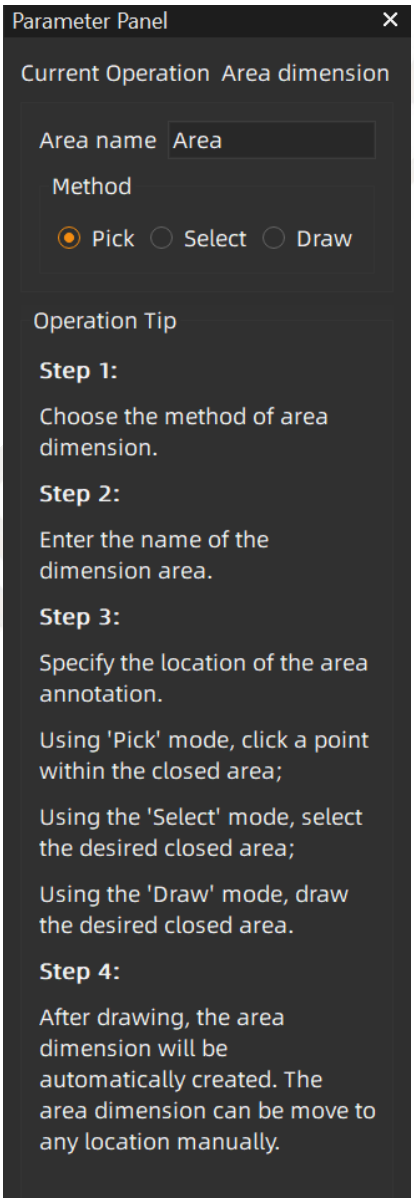


Figure: Area Dimension Parameter Panel

② Select "Pick Internal Point" in the parameter panel, then click a point inside the 2D closed area to complete the area dimensioning.

Figure: Area Dimension by Picking Internal Point

Selecting Boundary Lines Operation Steps:

① Click Vector -> Mark -> Area Dimension to activate area dimensioning.

② Select "Select Boundary Lines" in the parameter panel, then select the vector lines that form the closed area to be dimensioned in the view. Press Enter or right-click "Ok" to complete the area dimensioning.

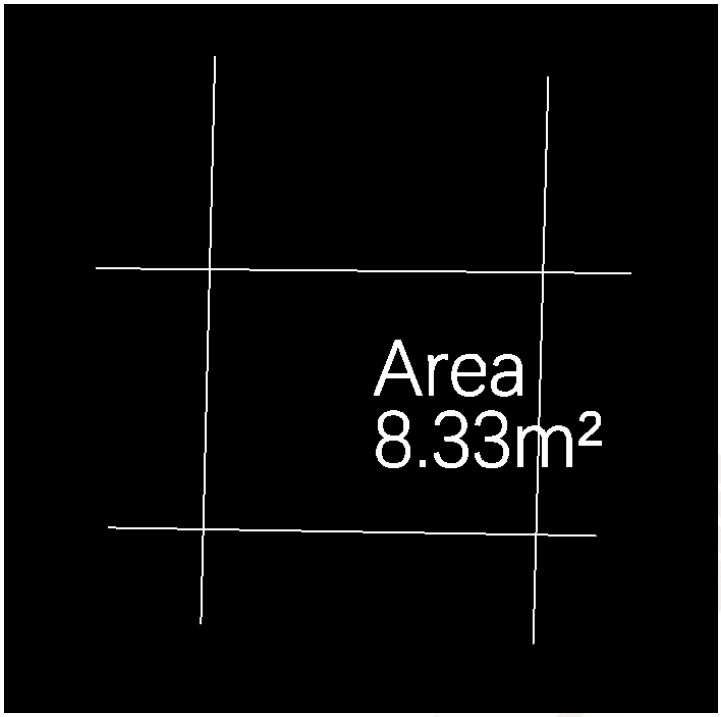


Figure: Area Dimension by Selecting Boundary Lines

Drawing Boundary Lines Operation Steps:

③ Click Vector -> Mark -> Area Dimension to activate area dimensioning.

④ Select "Draw Boundary Lines" in the parameter panel, then draw a 2D closed vector in the view. After drawing three points, right-click "Ok" or Press Enter/Double-click to end the drawing and complete the area dimensioning.

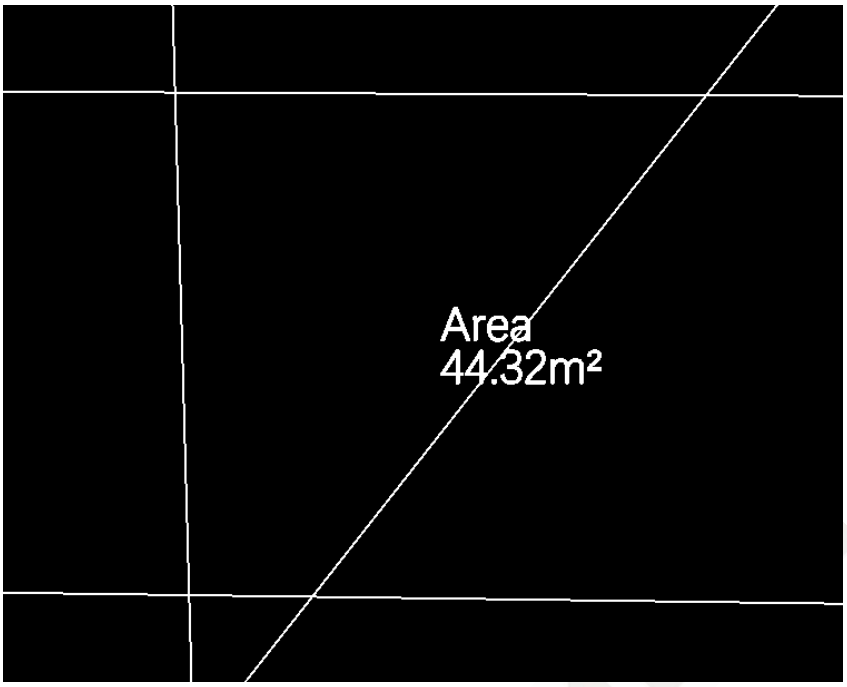


Figure: Area Dimension by Drawing Boundary Lines

2.4.4.3 Elevation Dimension

Function Description:

Click a point in the view to create an elevation dimension at the clicked position in an absolute or relative manner.

Absolute Elevation Operation Steps:

① Click Vector -> Mark -> Elevation Dimension to activate elevation dimensioning.

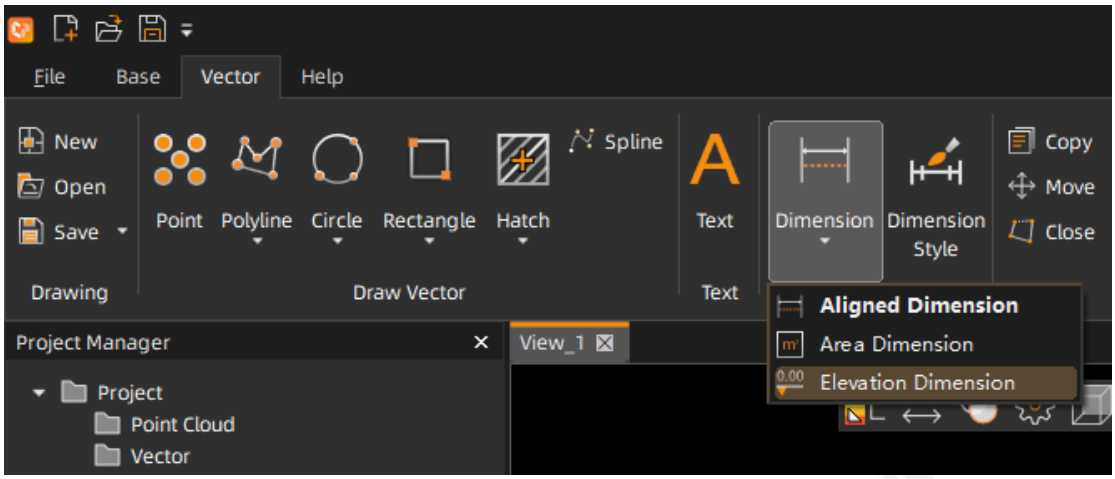


Figure: Elevation Dimension

② A parameter panel for elevation appears on the right side of the software. The " Absolute" elevation mode is selected by default. A message is outputted: Entered absolute elevation mode. Please click in the view to draw the elevation.

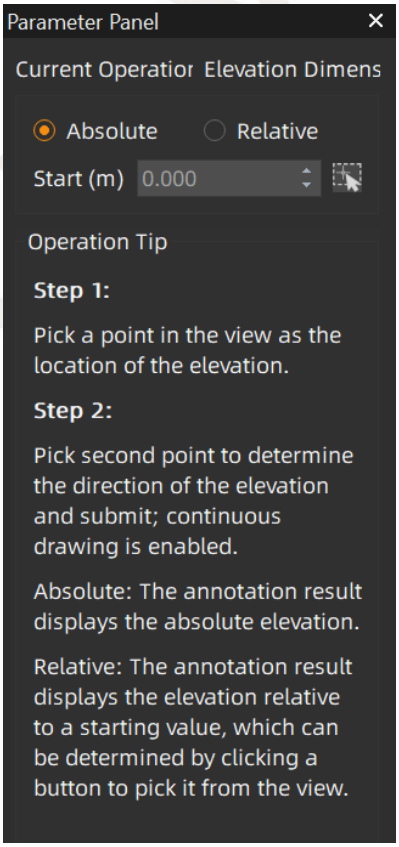


Figure: Elevation Parameter Panel

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

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

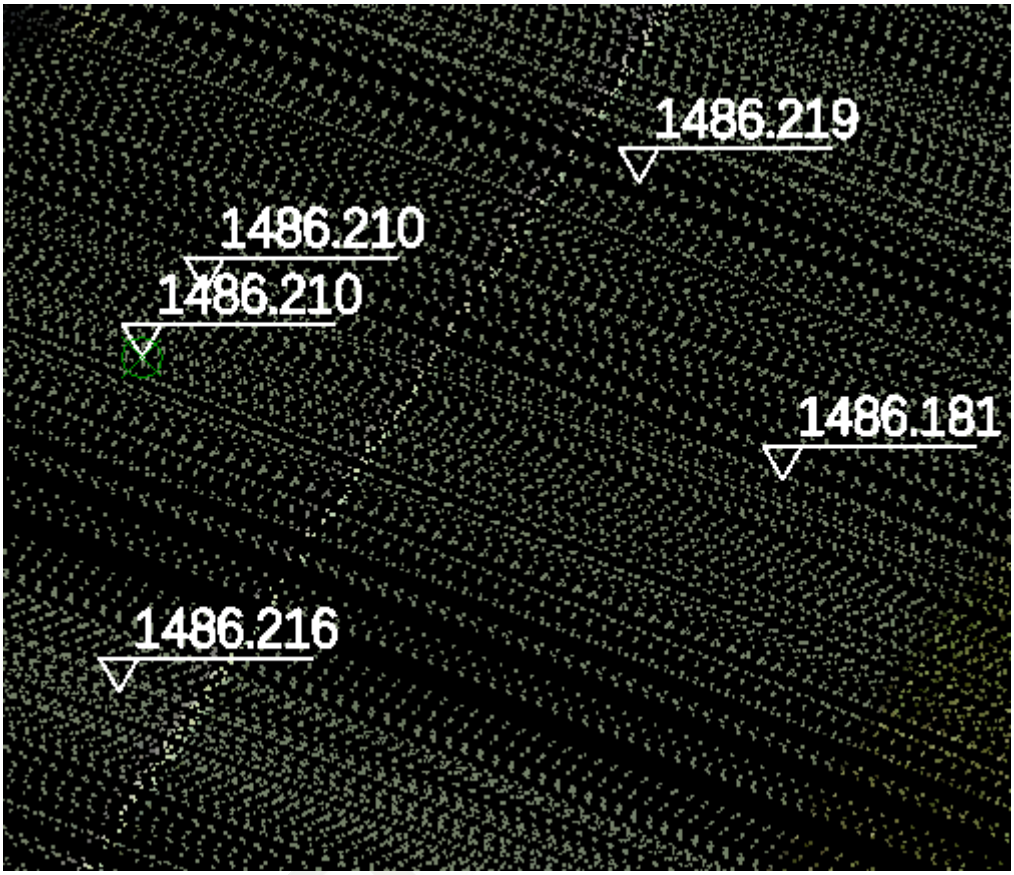


Figure: Absolute Elevation

Relative Elevation Operation Steps:

① Click Vector -> Mark -> Elevation Dimension to activate elevation dimensioning.

② A parameter panel for elevation appears on the right side of the software. Select "Relative" in the parameter panel. A message is outputted: Entered relative elevati on mode. Please set the starting elevation first, then click in the view to draw the elevation.

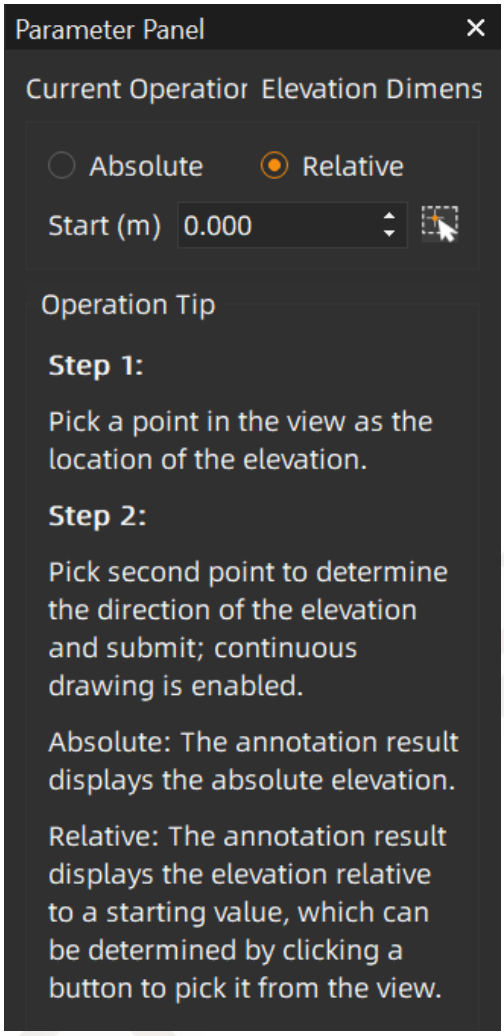


Figure: Elevation Parameter Panel

③ In the view, pick a point through the interaction button or manually enter the starting elevation.

④ In the view, click a point to determine the position of the elevation dimension.

⑤ In the view, click a second point to determine the direction of the elevation dimension.

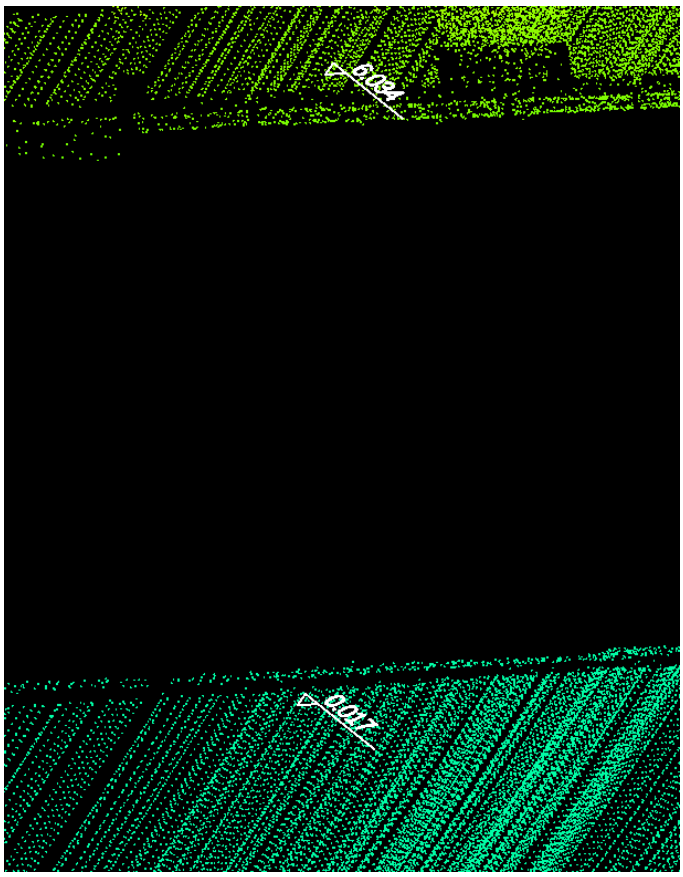


Figure: Relative Elevation

2.4.5 Dimension Style

2.4.5.1 Line

Function Description:

Set the drawing method of extension lines in aligned dimensions, which can be set to fixed extension line length or non-fixed extension line length. When in fixed extension line length, the length of the fixed extension line can be entered. The settings take effect for subsequent aligned dimension drawings and are invalid for existing aligned dimension results.

Operation Steps:

① Click Vector -> Mark->Dimension Style.

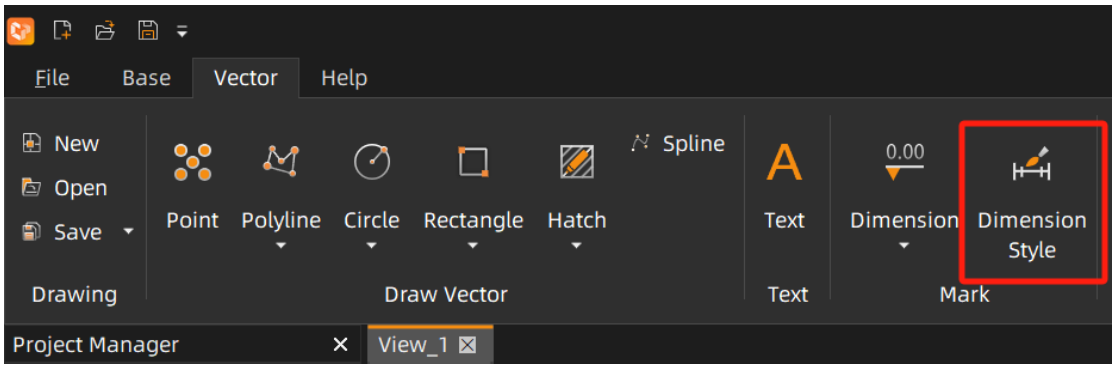


Figure: Dimension Style

② Click "Line" to enter the line style management interface.

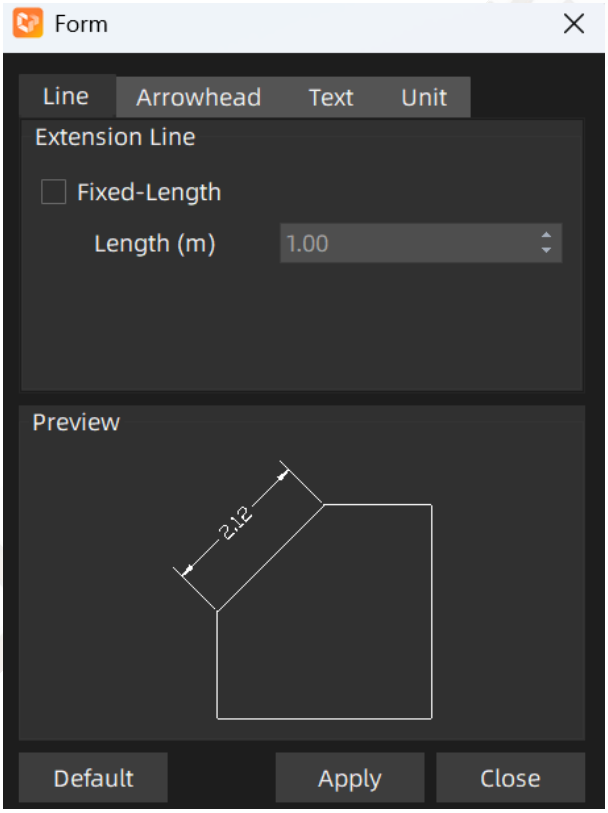


Figure: Line Setting Interface

③ Check "Fixed Length" and set the extension line

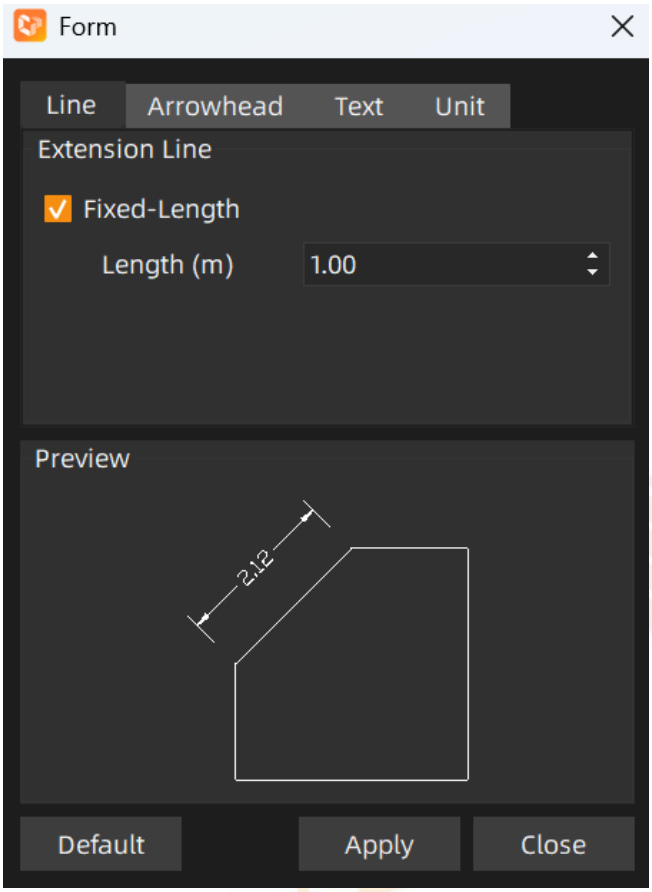


Figure: Check Fixed Extension Line Length

When the interactive extension line length is less than the set fixed extension line length value, the aligned dimension is completed according to the interactive extension line length; when the interactive extension line length is greater than the set fixed extension line length value, the length of the extension line is the set fixed extension line length value.

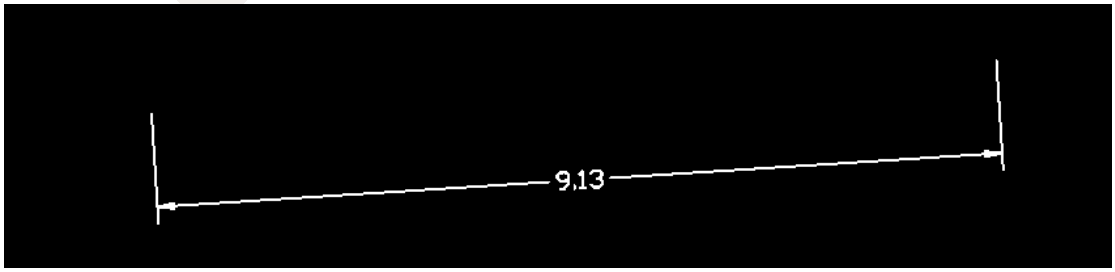


Figure: Fixed Extension Line Result

2.4.5.2 Arrow

Function Description:

Set the style of arrows in aligned dimensions. After modification and application, it takes effect for subsequent aligned dimension drawings and is invalid for existing aligned dimension results.

Operation Steps:

① Click Vector -> Mark ->Dimension Style.

② Click Arrow to enter the arrow management interface.

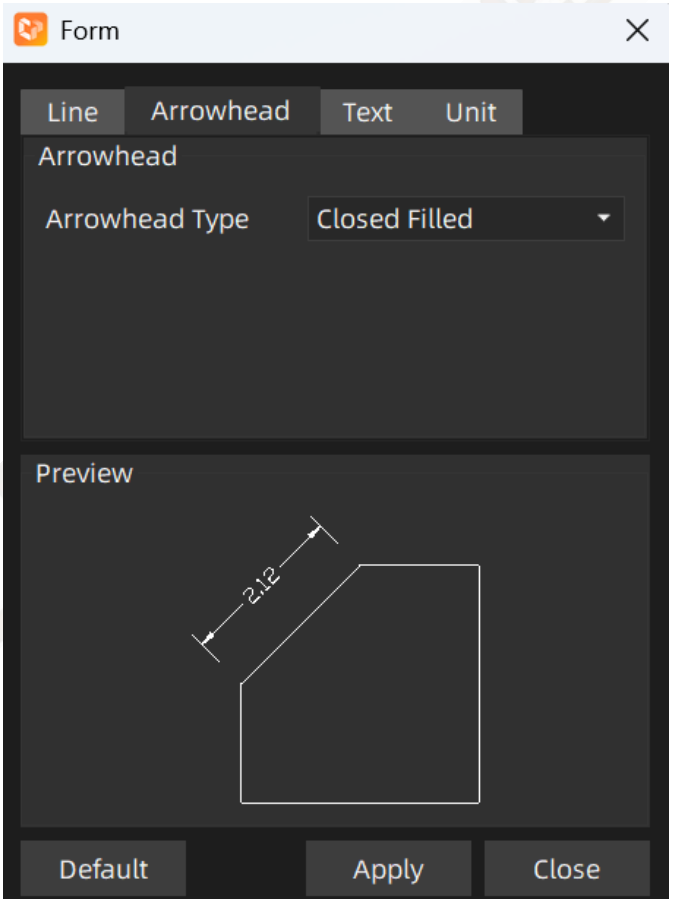


Figure: Arrow Setting Interface

③ Click the drop-down box of arrow type, select different styles, and the arrow type of the dimension will be modified to the corresponding style.

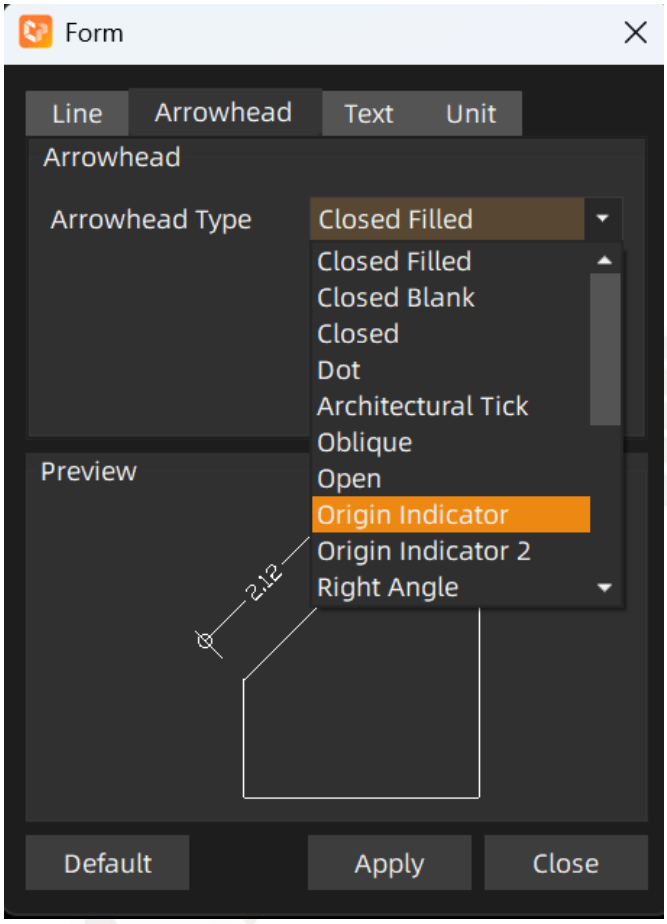


Figure: Select Arrow Style

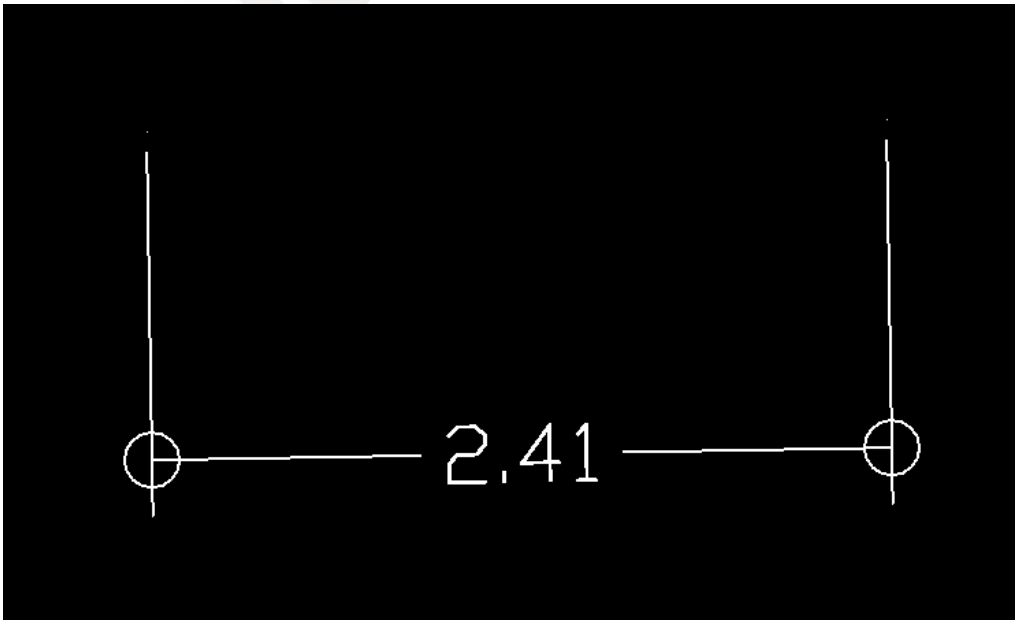


Figure: Modified Arrow Style Result

2.4.5.3 Text

Function Description:

Set the alignment, horizontal position, vertical position, and height effect of text in aligned dimensions. After modification and application, it takes effect for subsequent aligned dimension drawings and is invalid for existing aligned dimension results.

Operation Steps:

① Click Vector ->Mark-> Dimension Style.

② Click Text to enter the text management interface.

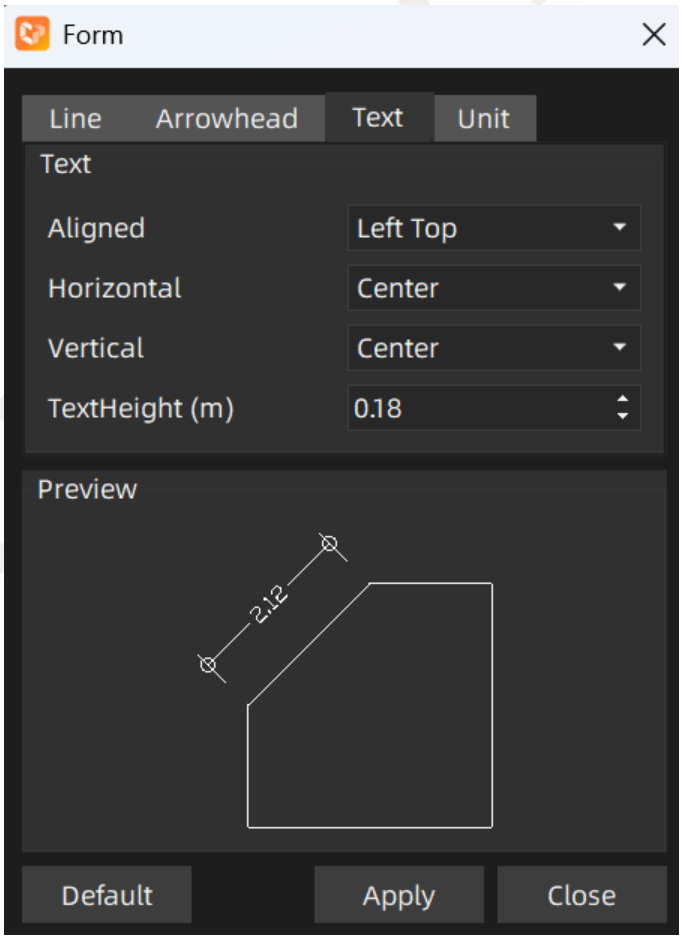


Figure: Text Setting Interface

③ Click the drop-down box of "Aligned". When the mouse is in the aligned drop-down box, the preview effect of the text alignment type will change with the mouse selection. After clicking an option in the drop-down box, the alignment type will be changed to the selected one.

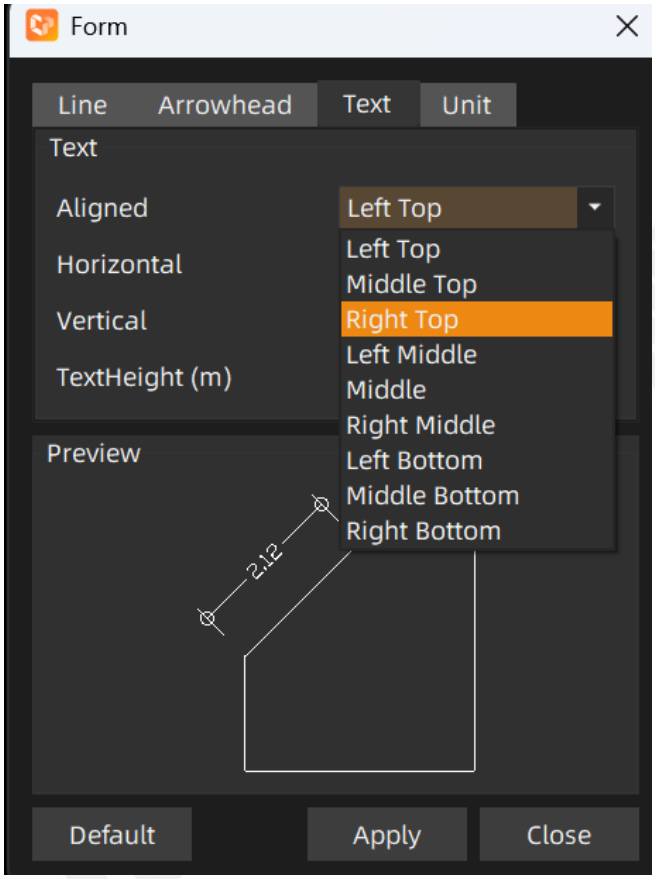


Figure: Select Alignment Method

④ Click the drop-down box of "Horizontal" and select an option in the drop-down box to modify the text position in the dimension to the corresponding style.

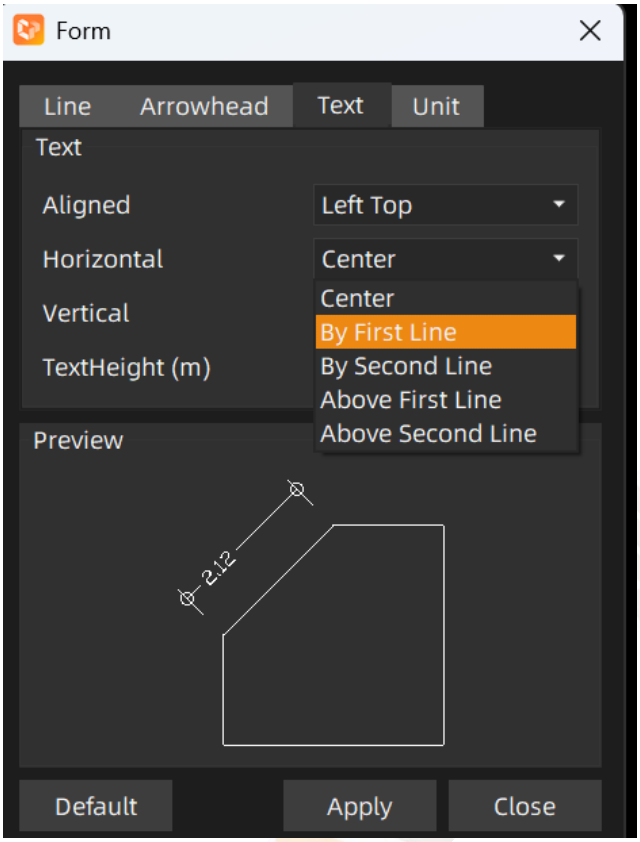


Figure: Select Text Horizontal Position

⑤ Click the drop-down box of "Vertical" and select an option in the drop-down box to modify the text position in the dimension to the corresponding style.

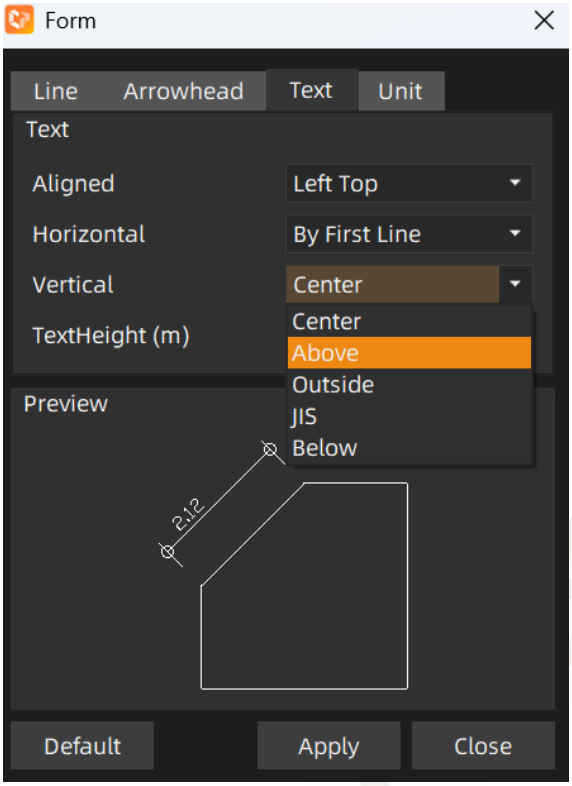


Figure: Select Text Vertical Position

⑥ Click the input box of "TextHeight". The text height can be adjusted in three ways: inputting, scrolling the mouse wheel, and adjusting buttons.

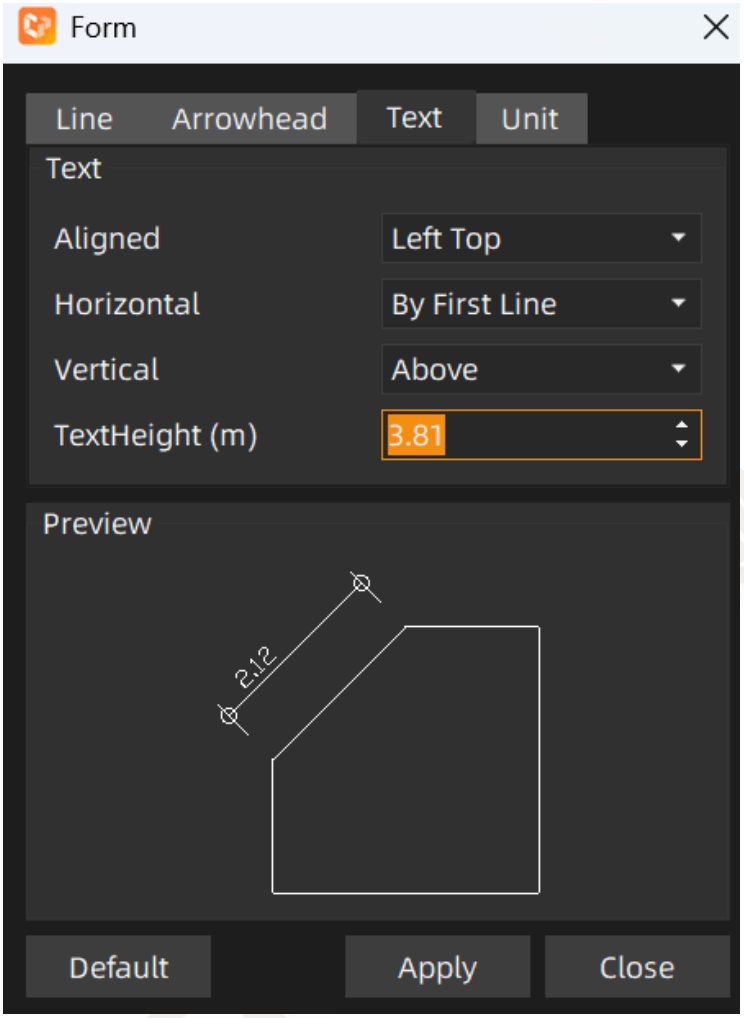


Figure: Result After Modifying Text Settings and Application

2.4.5.4 Display Unit

Function Description:

Set the unit and precision of the dimension results in aligned dimensions. After modif ication and application, it takes effect for subsequent aligned dimension drawings and is invalid for existing aligned dimension results.

Operation Steps:

① Click Vector ->Mark -> Dimension Style.

② Click Unit to enter the unit management interface.

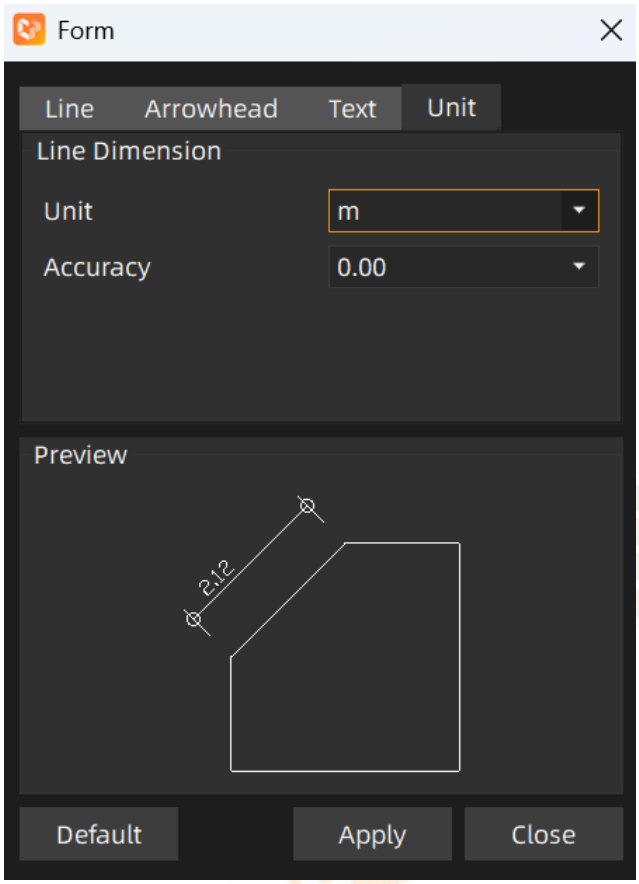


Figure: Unit Setting Interface

③ In unit interface, the display unit and accuracy can be modified. When modifying the accuracy option, the preview effect will be refreshed in real time.

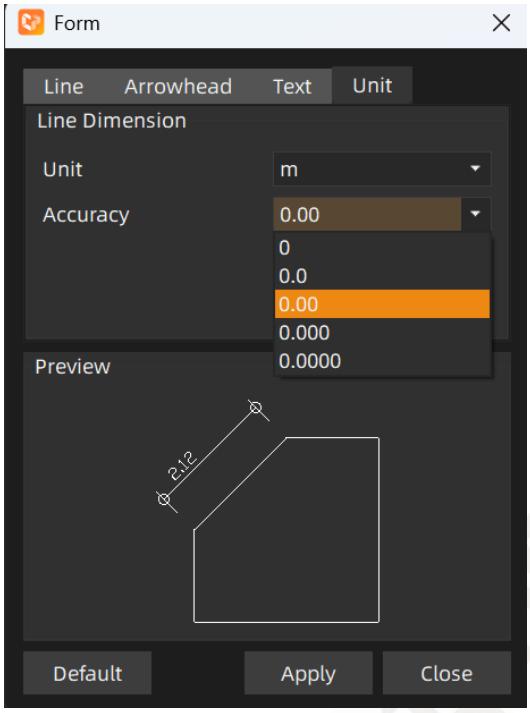


Figure: Accuracy Adjustment

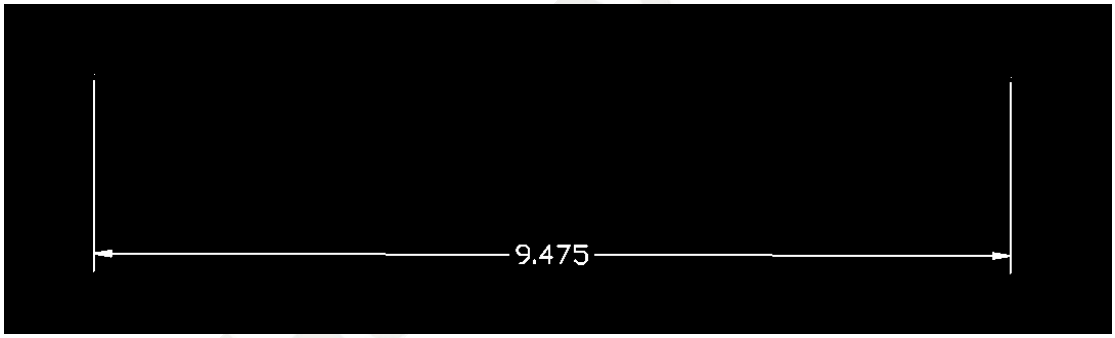


Figure: After Modifying Accuracy

2.4.6 Edit

2.4.6.1 Copy

Function Description:

Copy the selected vector to the specified position in the drawing.

Operation Steps:

① Click Vector -> Edit -> Copy.

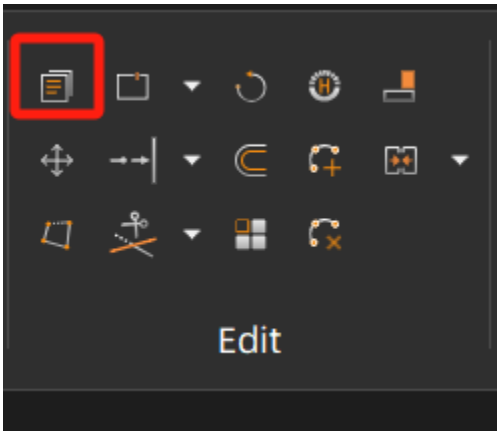


Figure: Copy

② In the view, select the vector to be copied (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection set.

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

④ Move the mouse position and click again to copy the vector to the specified position, supporting continuous copying.

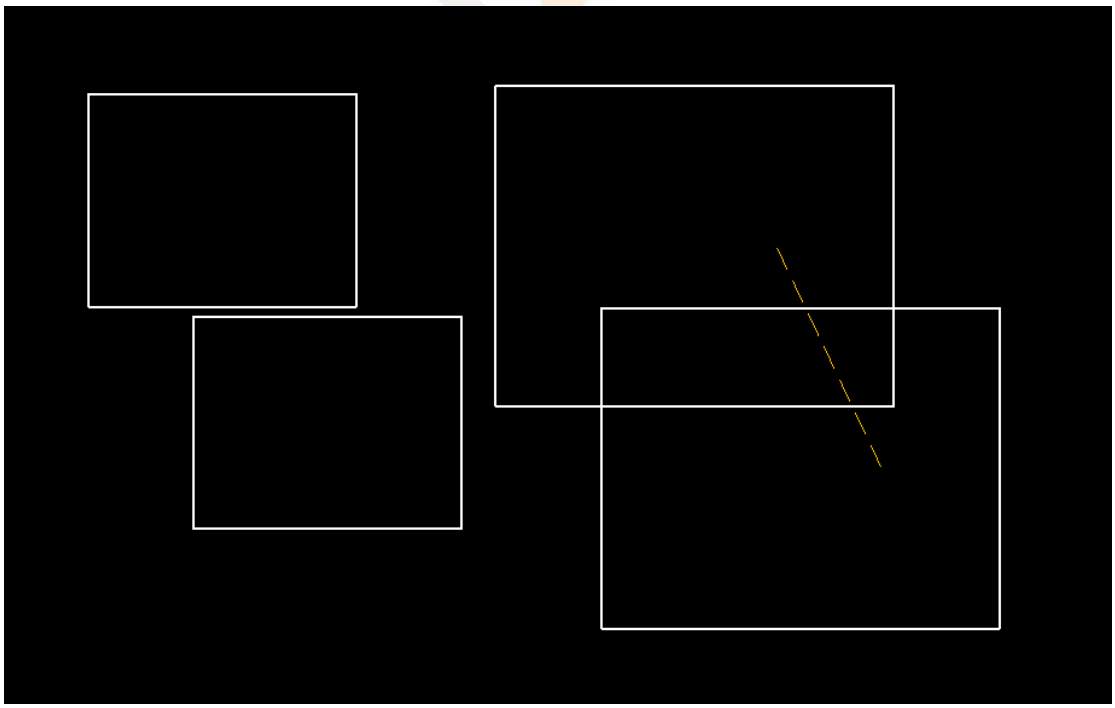


Figure: Copy Vector

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.

2.4.6.2 Move

Function Description:

Move the selected vector to the specified position in the drawing.

Operation Steps:

① Click Vector -> Edit -> Move.

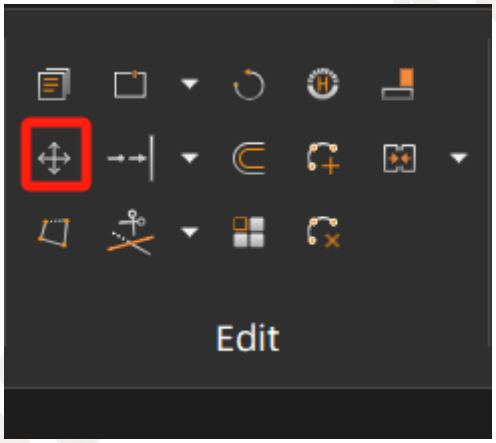


Figure: Move

② In the view, select the vector to be moved (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection set.

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

④ Move the mouse position and click again to move the vector to the specified position.

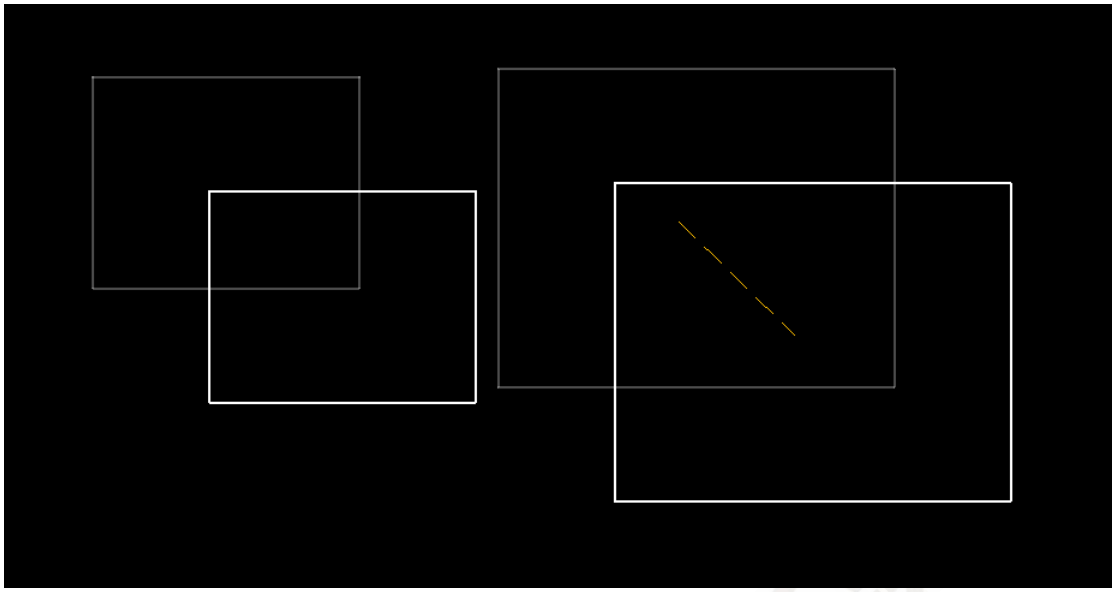


Figure: Move Vector

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.

2.4.6.3 Close

Function Description:

Connect the first and last points of the selected non-closed polyline to close it in the drawing.

Operation Steps:

① Click Vector -> Edit -> Close.

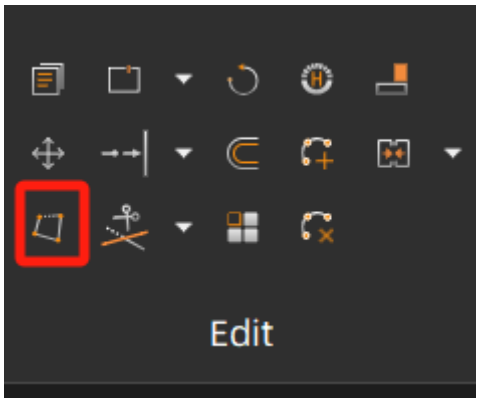


Figure: Close

② In the view, select the polyline to be closed, and the first and last points of the polyline will be connected to close it.

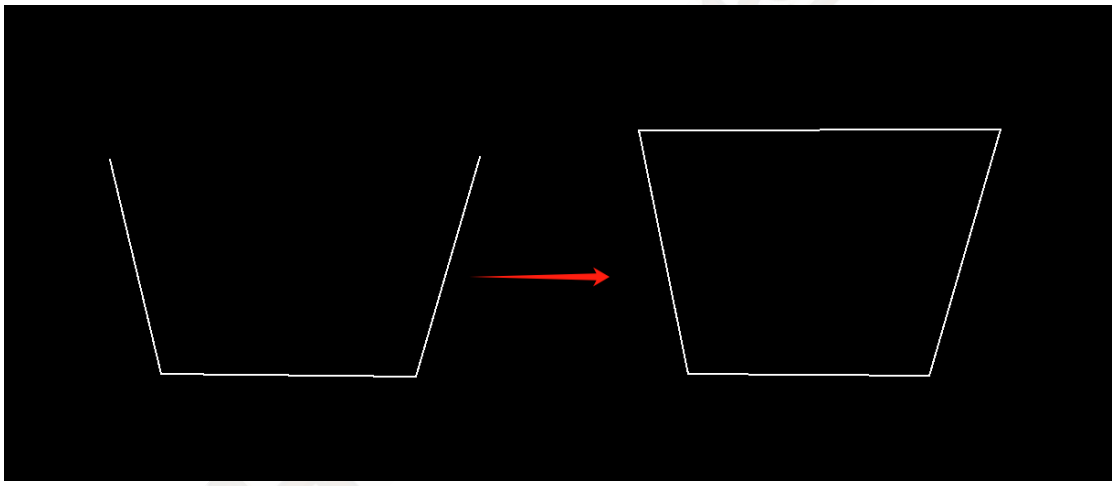


Figure: Close Result

2.4.6.4 Break

2.4.6.4.1 Break At Point

Function Description:

Select a vector in the drawing, specify a point, and break the vector from the specified position.

Operation Steps:

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

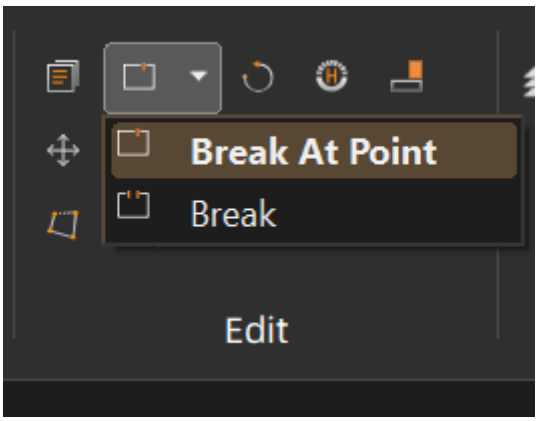


Figure: Break At Point

② In the view, select the vector to be broken.

③ Click a point on the selected vector to specify the break position, and the vector will be broken from the specified position.

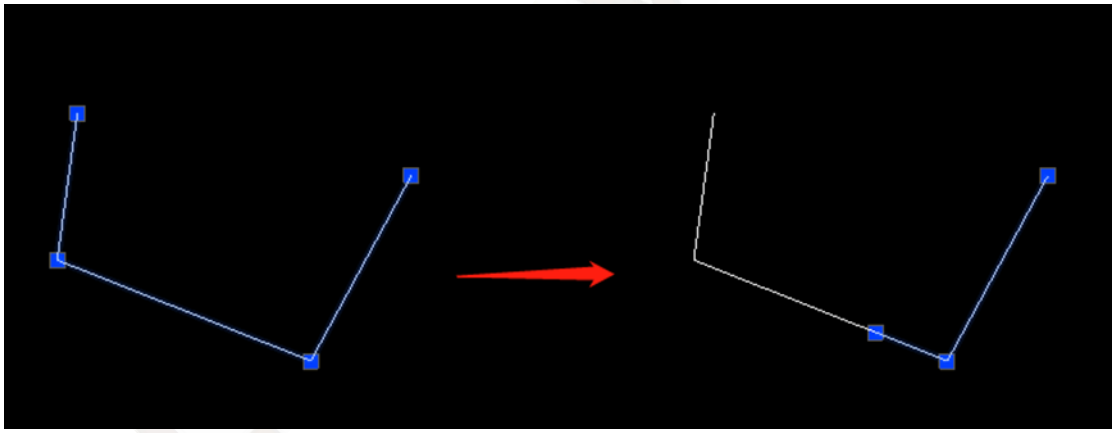


Figure: Single-Point Break Result

2.4.6.4.2 Two-Point Break

Function Description:

Select a vector in the drawing, specify two points, and break the vector between the t wo points.

Operation Steps:

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

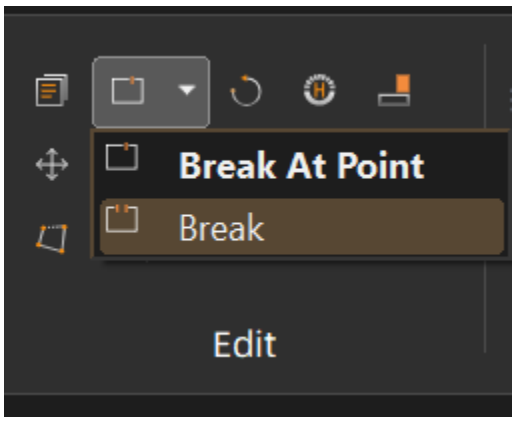


Figure: Break

② In the view, click to select the vector to be broken.

③ Click another point on the selected vector to specify the break position, and the vector will be broken between the two points.

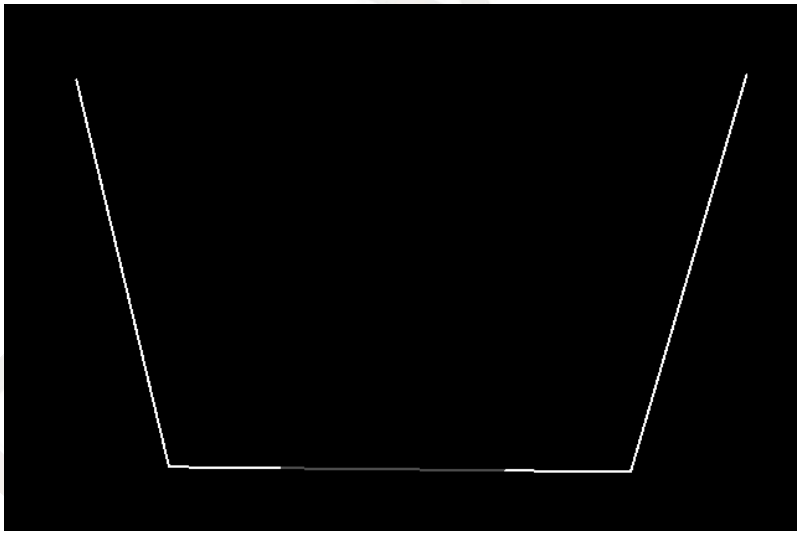


Figure: Two-Point Break Result

2.4.6.5 Extend

2.4.6.5.1 Standard Extend

Function Description:

Extend the vector in the drawing to the specified reference object.

Operation Steps:

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

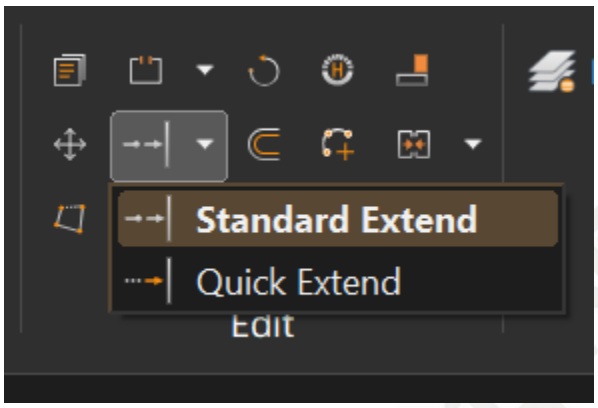


Figure: Standard Extend

② In the view, select the reference object first (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection.

③ In the view, click to select the vector to be extended, and the vector will be extended to the reference object , supporting multiple extensions.

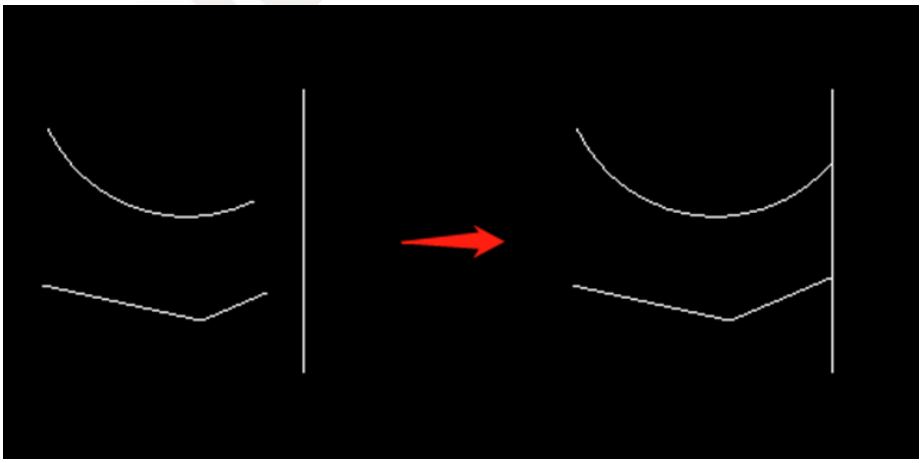


Figure: Standard Extend Result

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 ex tend function can be used.

2.4.6.5.2 Quick Extend

Function Description:

Extend the vector in the drawing to the nearest vector object.

Operation Steps:

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

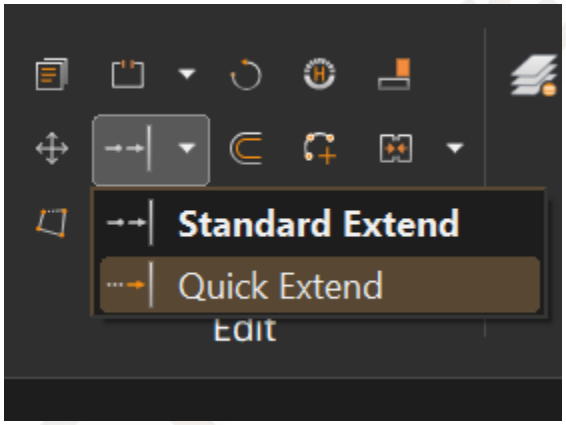


Figure: Quick Extend

② In the view, click to select the vector to be extended, and the vector will be ext ended to the nearest vector object, supporting multiple extensions.

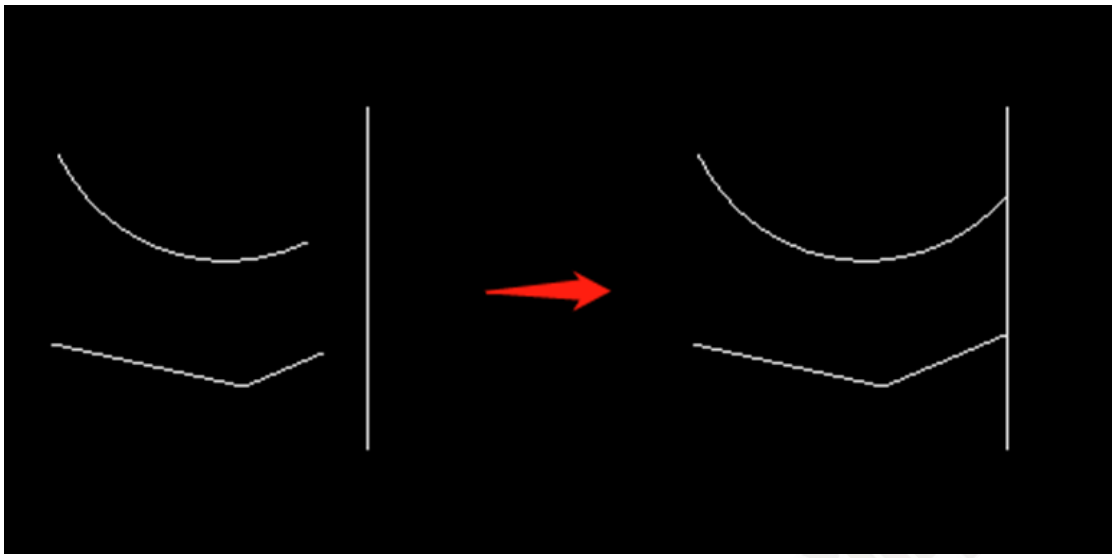


Figure: Quick Extend Result

2.4.6.6 Trim

2.4.6.6.1 Standard Trim

Function Description:

After selecting the reference object, trim off the part of the vector object in the drawing that intersects with the reference object.

Operation Steps:

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

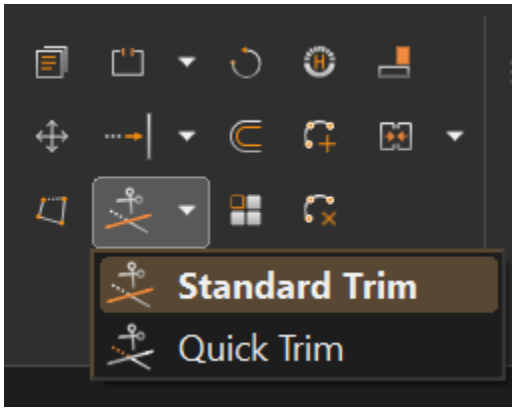


Figure: Standard Trim

② In the view, select the reference object (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection set.

③ In the view, click to select the part of the vector object that intersects with the reference object and needs to be trimmed, and that part of the vector object will be trimmed off, supporting multiple trims.

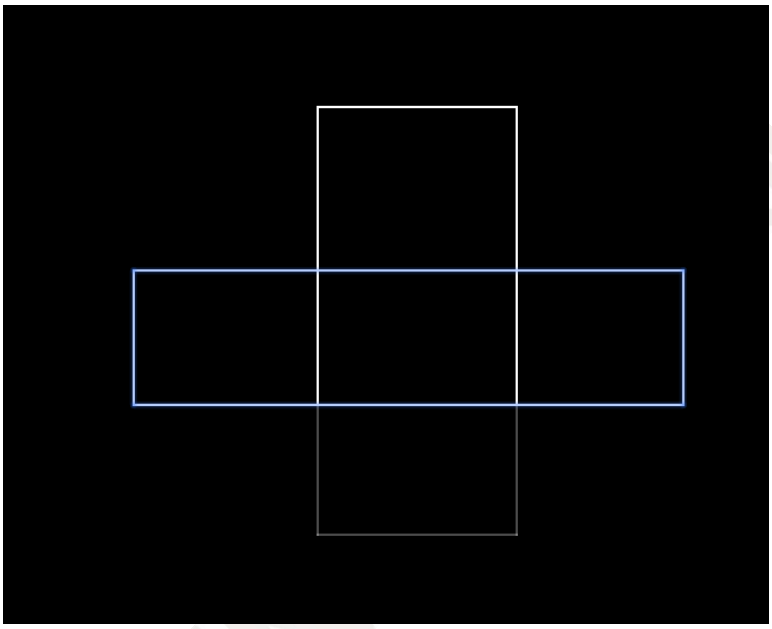


Figure: Standard Trim Result

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.

2.4.6.6.2 Quick Trim

Function Description:

Select a vector object in the drawing and trim off a part of the vector object from the intersection.

Operation Steps:

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

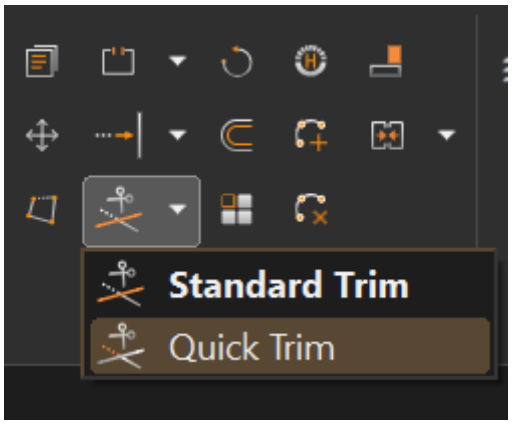


Figure: Quick Trim

② In the view, click to select the part of the vector object that needs to be trimmed, and that part of the vector object will be trimmed off from the intersection, supporting multiple trims.

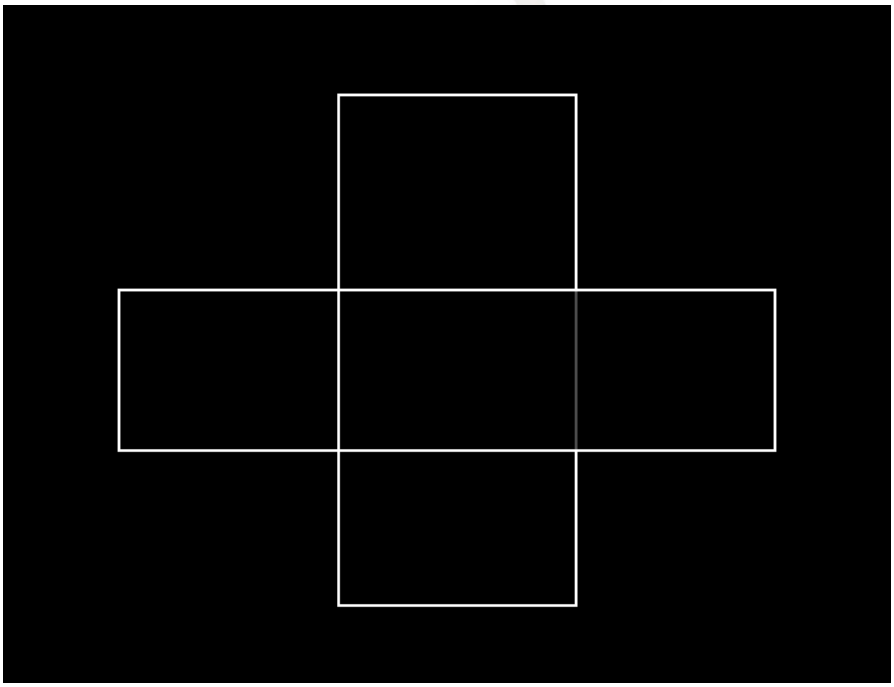


Figure: Quick Trim Result

2.4.6.7 Rotate

Function Description:

Rotate the selected vector to the specified position in the drawing.

Operation Steps:

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

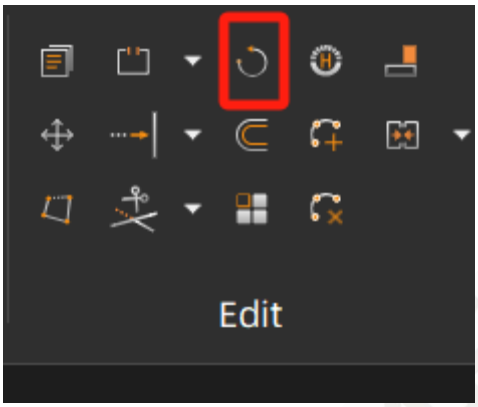


Figure: Rotate

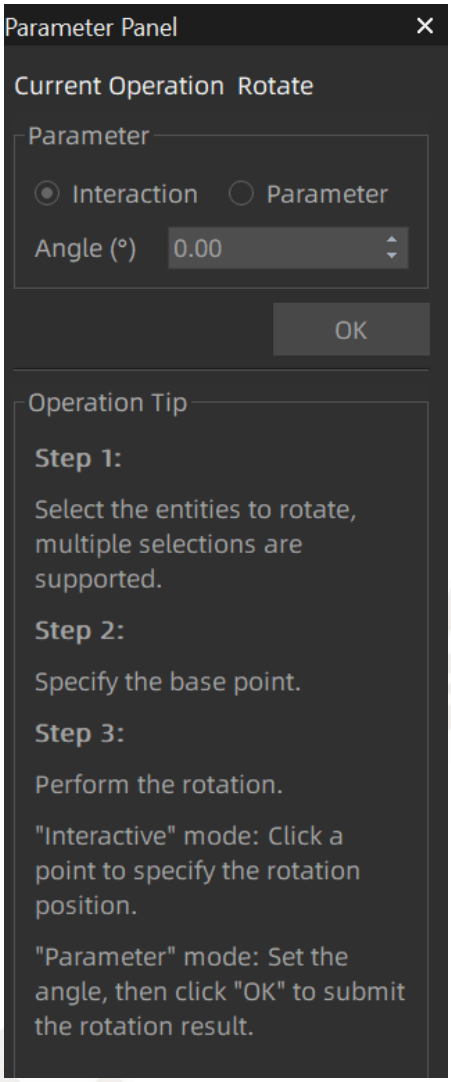


Figure: Rotate Parameter Panel

② In the view, select the vector to be rotated (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection set.

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

④ Move the mouse position, determine the angle and click again, or select "Parameter" in the parameter panel, enter the angle value and click the "Ok" button to rotate the vector to the specified position.

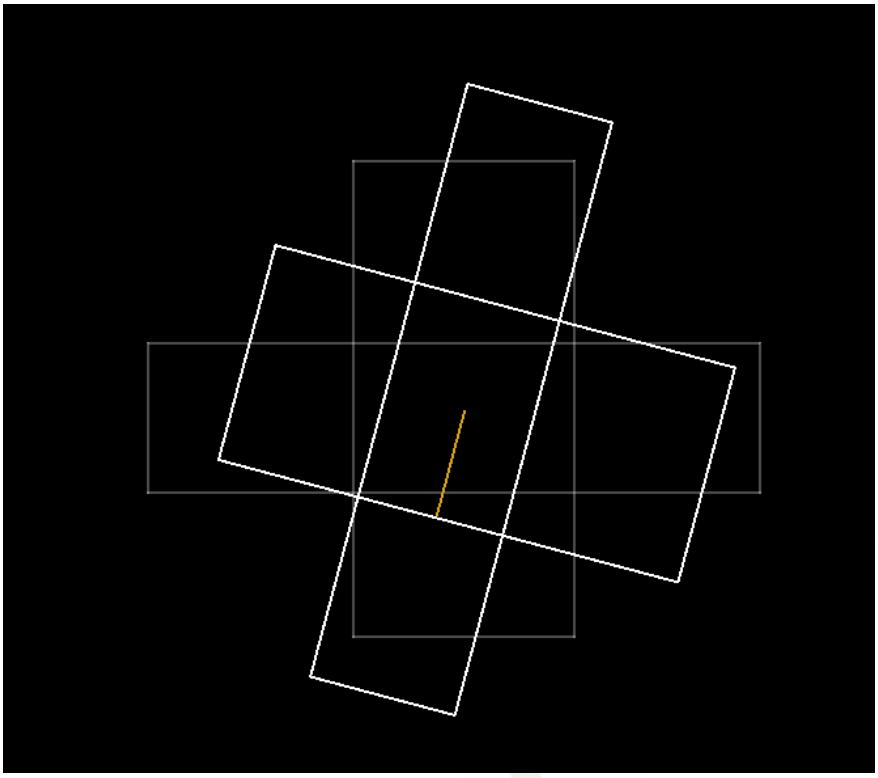


Figure: Rotate Vector

Parameter Settings:

Angle (°): The angle value by which the vector rotates counterclockwise around the base point, with a setting range of [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.

2.4.6.8 Offset

Function Description:

Select the vector to be offset, and use interactive or parameter methods to offset the selected vector in the specified direction and distance for a single or continuous offset to generate a new vector.

Operation Steps:

① Click Vector ->Edit ->Offset to activate offset.

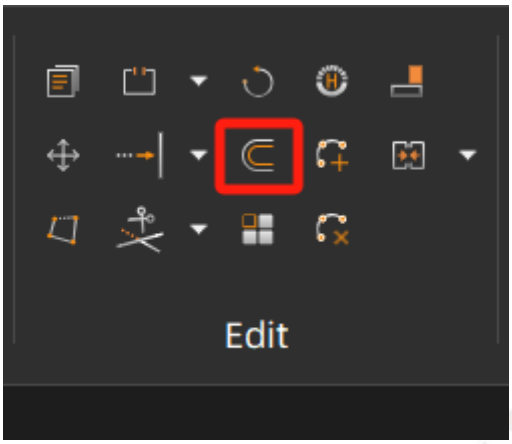


Figure: Offset Button

② A parameter panel for offset appears on the right side of the software.

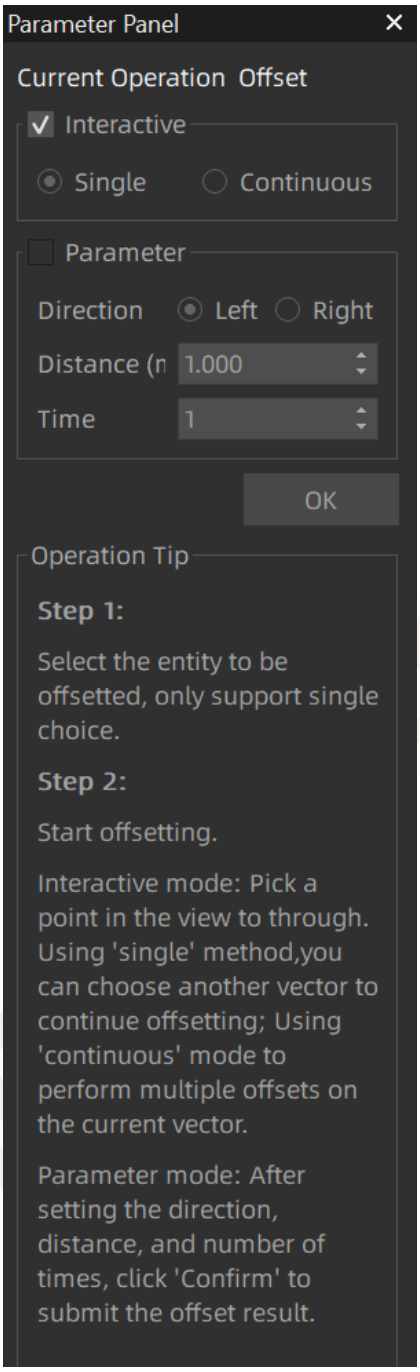


Figure: Offset Parameter Panel

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

In "Interactive" mode, "Single Offset" performs one offset on the currently selected vector, and after offsetting, you need to select the vector again for offsetting; if "Contin

uous Offset" is selected, multiple offsets can be performed continuously on the current ly selected vector.

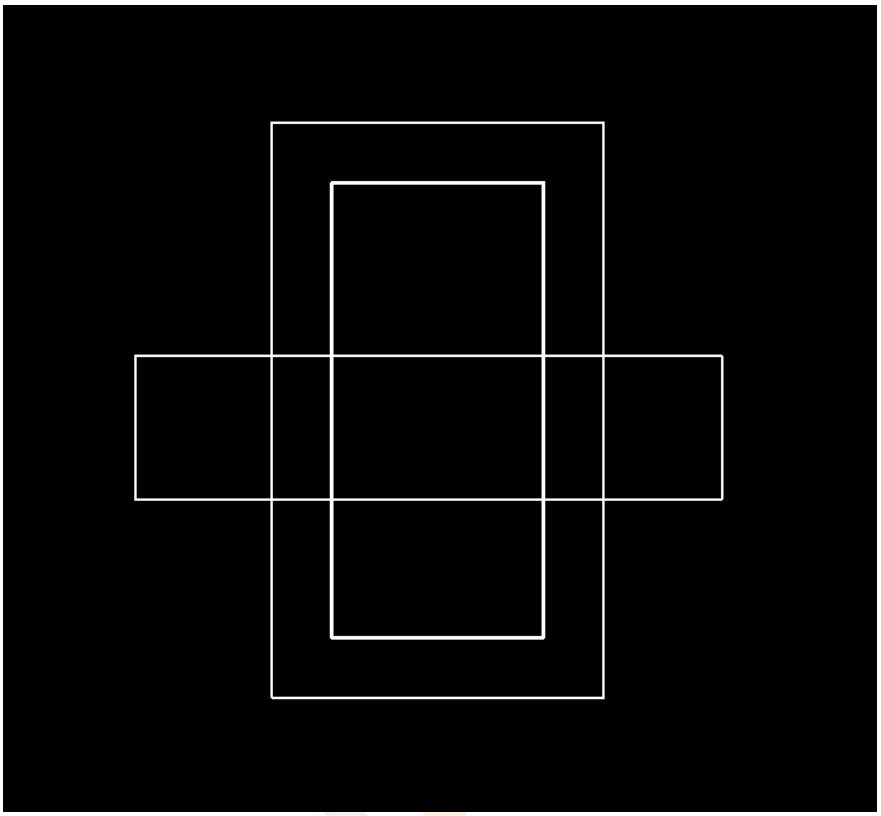


Figure: Offset Preview

④ Move the mouse position, determine the position and click again, or select "Para meter" in the parameter panel, enter the "direction, distance and times" of the off set and click the "Ok" button to generate the offset vector at the specified positio n.

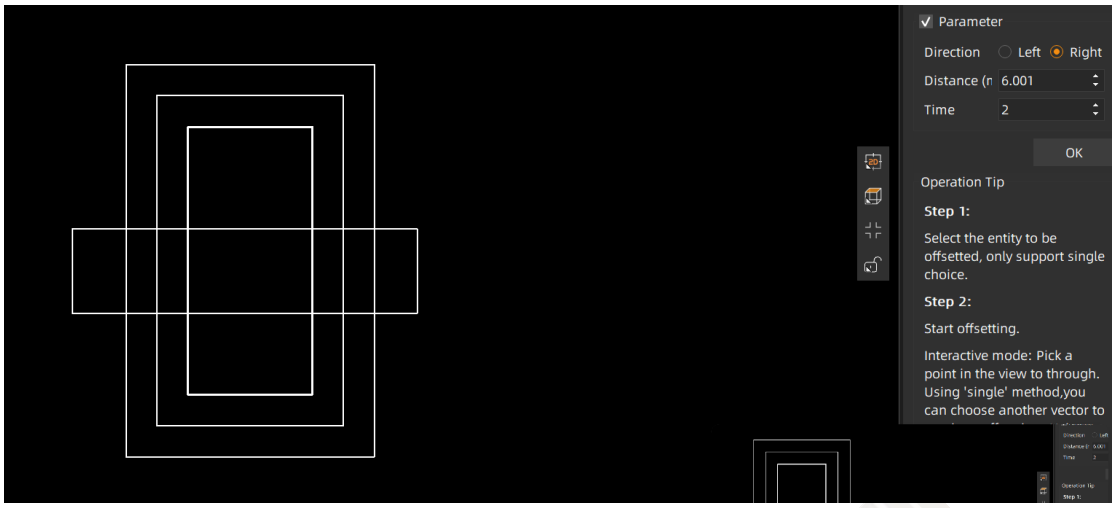


Figure: Offset Result

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.

2.4.6.9 Array

Function Description:

Select the vector to be arrayed, modify the number of rows and columns, row spacing, and column spacing, and click "Ok" to create copies distributed in a rectangle.

Operation Steps:

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

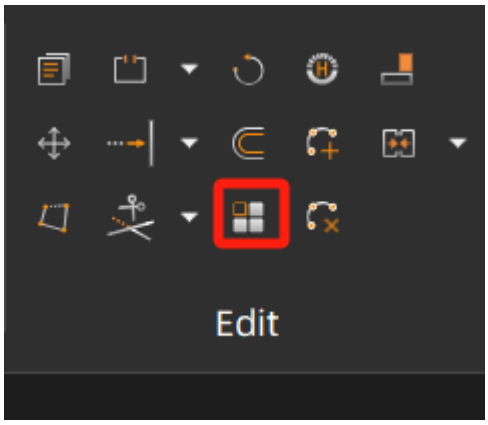


Figure: Array

② A parameter panel for array appears on the right side of the software.

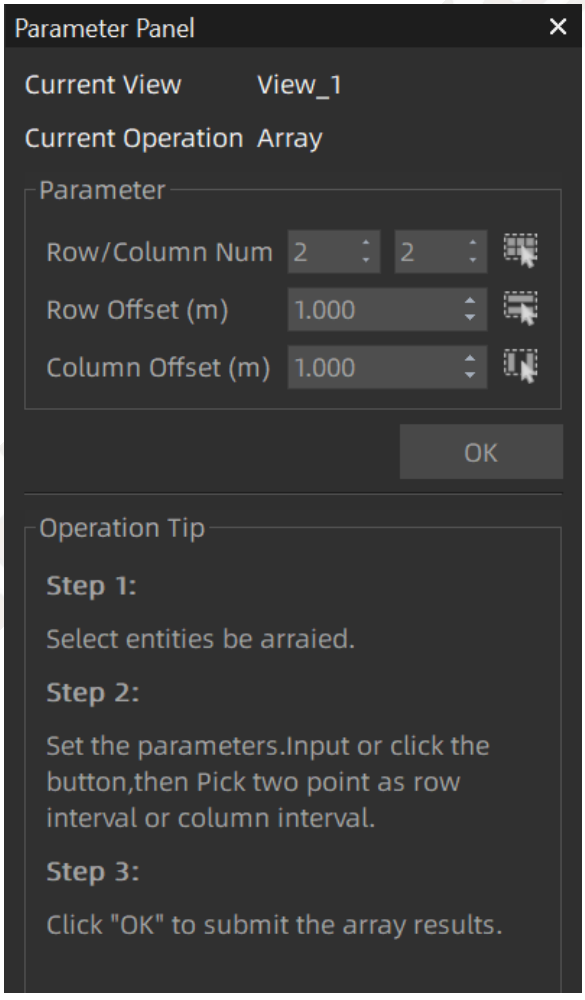


Figure: Array Parameter Panel

③ In the view, select the vector to be arrayed (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection set.

④ Set parameters, manually enter the number of rows and columns, row spacing, and column spacing, or click the button next to the parameter to interactively specify the number of rows and columns, row spacing, and column spacing in the view.

⑤ Click "Ok" to submit the array result.

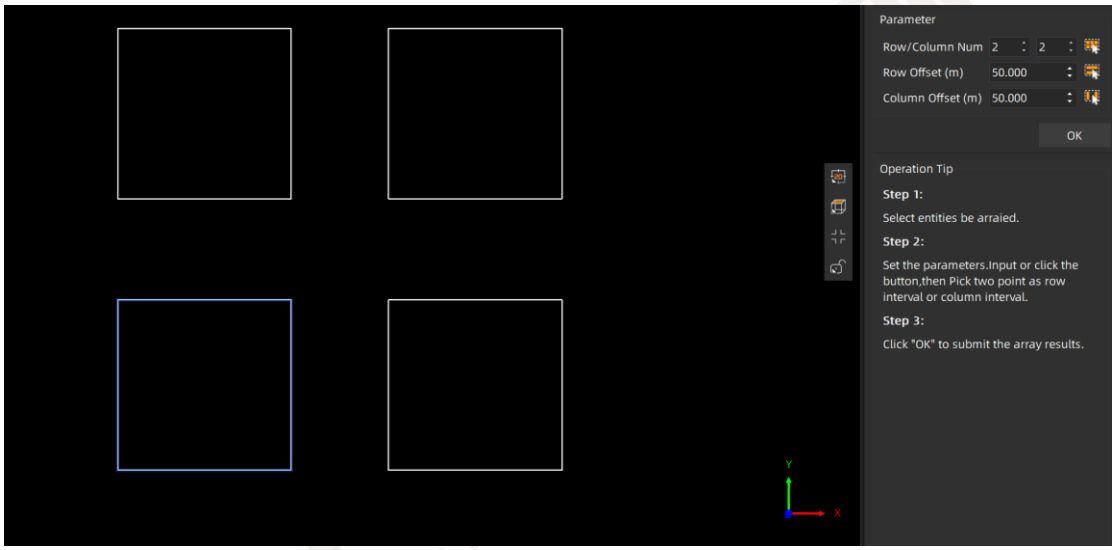


Figure: Array Effect

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.

2.4.6.10 Elevation Edit

Function Description:

Modify the elevation value of the selected vector in the relative value or absolute value.

Operation Steps:

① Click Vector ->Edit ->Elevation Edit to activate elevation edit. Output message: Please select the vector whose elevation needs to be modified, click the right-click menu "Ok" or shortcut key Enter to end the selection.

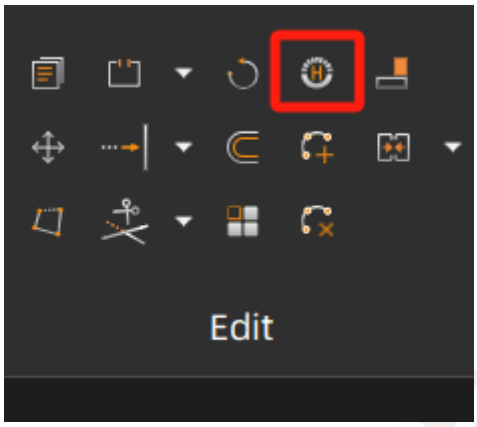


Figure: Elevation Edit

② In the view, select the vector whose elevation needs to be modified (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection set. Output message: Please set the modification method and elevation value in the parameter panel.

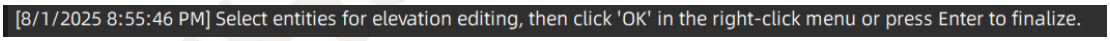


Figure: Output Message

③ Set parameters. Select "Relative Value" to modify relative to the original elevation of the vector; select "Absolute Value" to directly modify the vector to the set elevation.

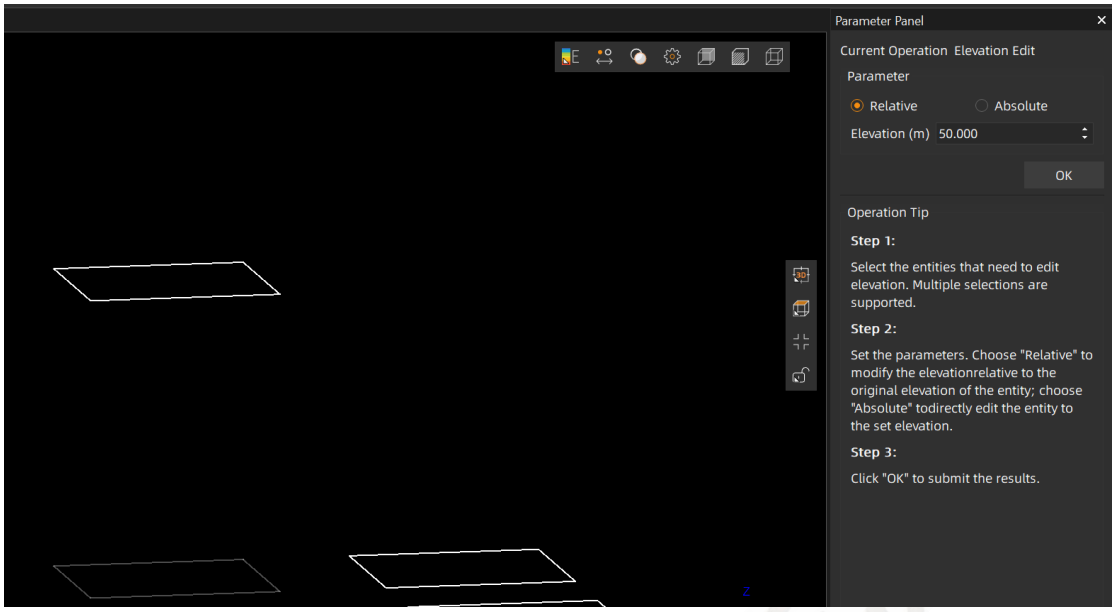


Figure: Relative Value Preview Effect

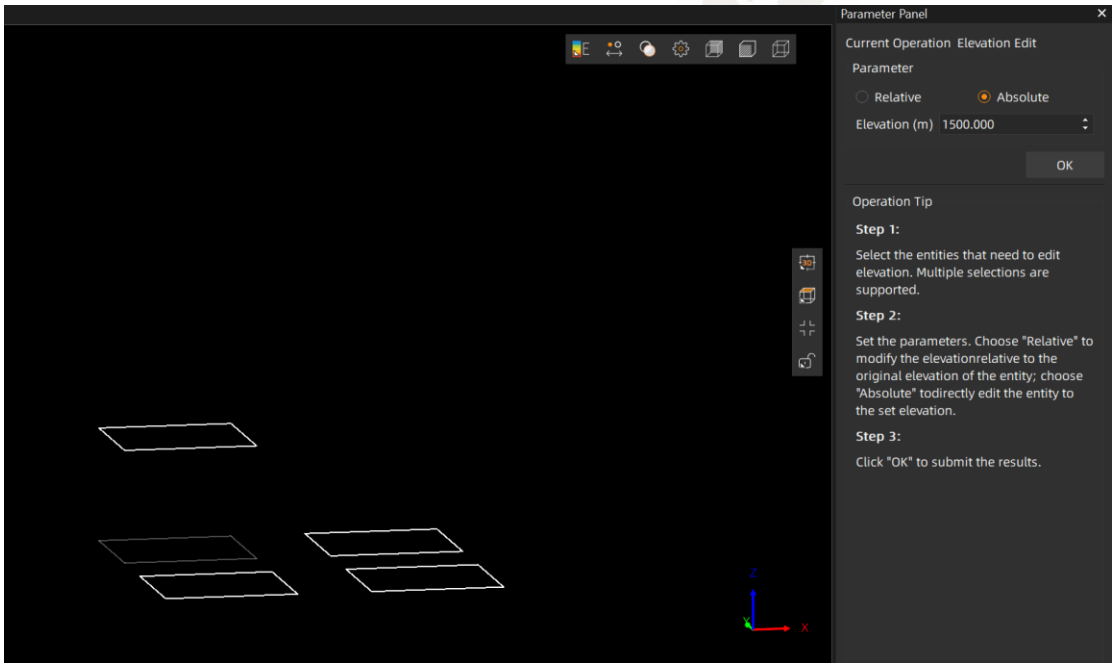


Figure: Absolute Value Preview Effect

④ Click "Ok" 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.

2.4.6.11 Add Vertex

Function Description:

Add vertices to existing polyline, 3D polyline, and arc elements.

Operation Steps:

① Click Vector ->Edit-> Add Point.

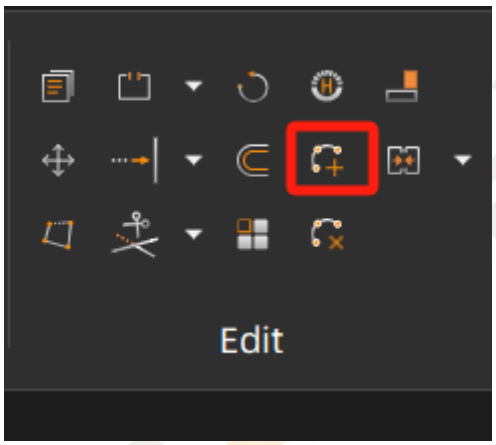


Figure: Add Point

② In the view, select the vector to add points (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection set.

③ Left-click on the selected vector to add a vertex at the clicked position.

④ You can exit the add point function by double-clicking the left mouse button/right-clicking to cancel/Esc.

2.4.6.12 Delete Vertex

Function Description:

Delete vertices when the existing polyline or 3D polyline has more than two vertices.

Operation Steps:

① Click Vector ->Edit-> Delete Point.

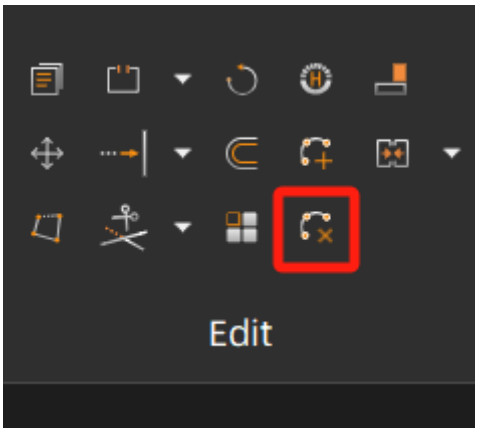


Figure: Delete Point

② In the view, select the required vector (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection set.

③ Left-click the vertex of the selected vector. If the selected vector is a polyline or 3D polyline with more than two vertices, the selected vertex will be deleted; otherwise, the vertex will not change.

④ You can exit the delete point function by double-clicking the left mouse button/right-clicking to cancel/Esc.

2.4.6.13 Move Point

Function Description:

Move existing vector nodes.

Operation Steps:

① After selecting the vector, click the intersection point of the vector. When the intersection point turns red, move the mouse position, and the vertex position will move with the mouse.

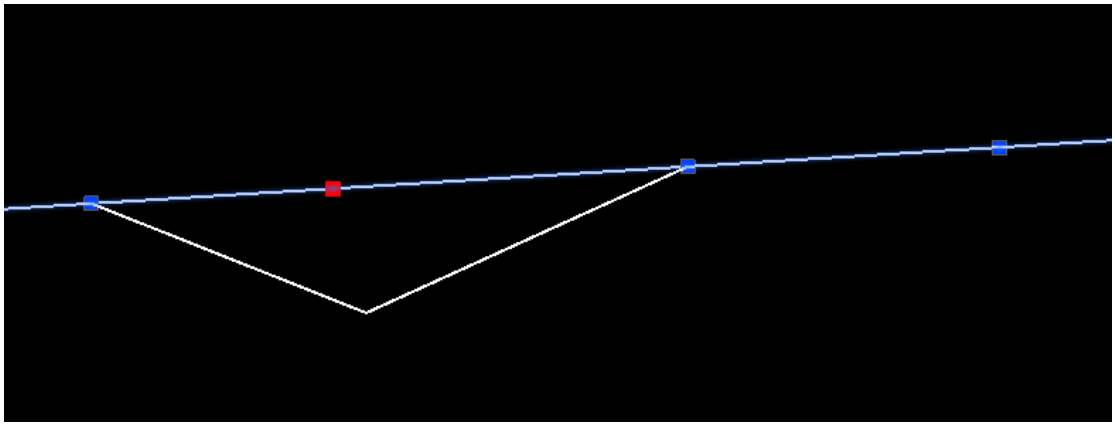


Figure: Move Point

② Select the target position in the view and left-click the mouse to complete the point movement.

③ The point moving operation does not need to be exited manually.

1. 2.4.6.14 Align

Function Description:

Move and rotate the selected vector based on two origin points and target points.

Operation Steps:

① Click Vector -> Edit -> Align.

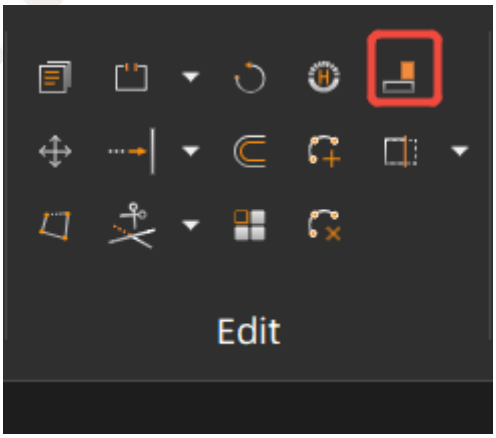


Figure: Align

② In the view, select vectors that need to be aligned (support selecting multiple vectors), click the right-click menu "Ok" or press the shortcut key Enter to end the selection.

③ Click with the left mouse to select the "Origin Point1" and "Target Point1", then "Origin Point2" and "Target Point2". The selected vector will be moved and rotated according to the selected origin points and target points.

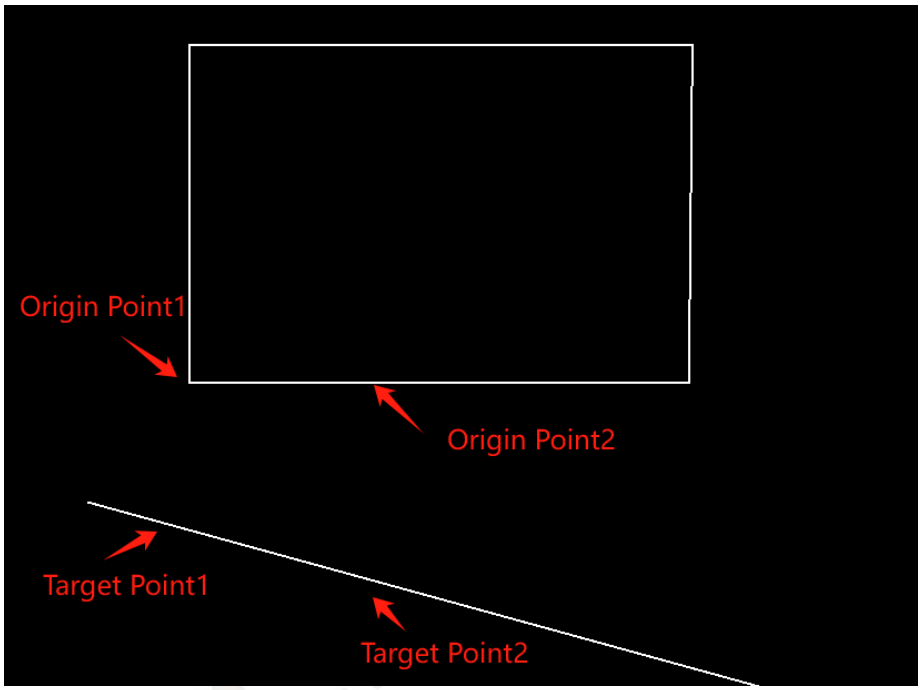


Figure: Select Points to Align

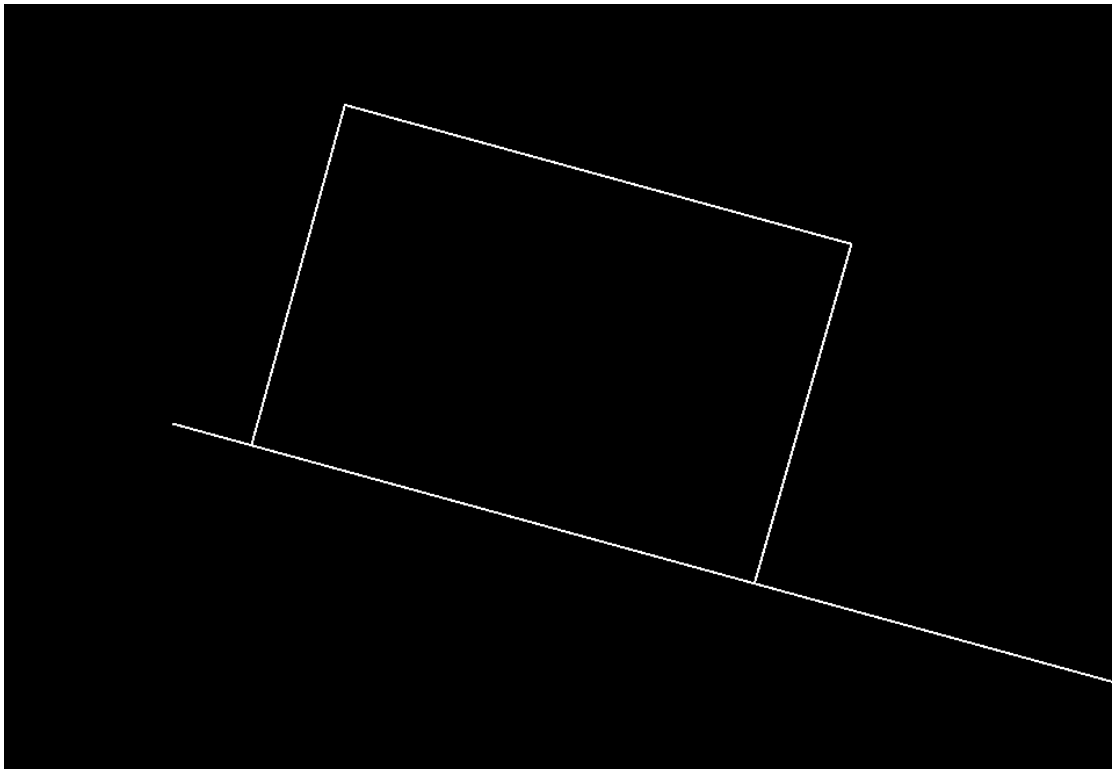


Figure: Effect of Alignment

④ Double-click the left mouse/Right-click and select"Cancel"/ESC to exit the align function.

Note:

The two sets of points are not allowed to overlap.

2.4.6.15 Advanced

2.4.6.15.1 Unite

Function Description:

Merge multiple selected vectors into one vector in the drawing.

Operation Steps:

① Click Vector -> Edit -> Advanced -> Unite.

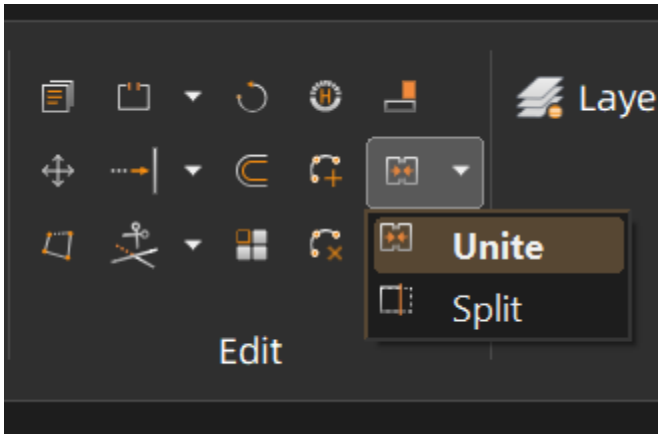


Figure: Unite

② In the view, select multiple vectors with connected endpoints (support selecting multiple groups of vectors to merge respectively), and multiple vectors can be merged into one vector element. Continuous merging is supported.

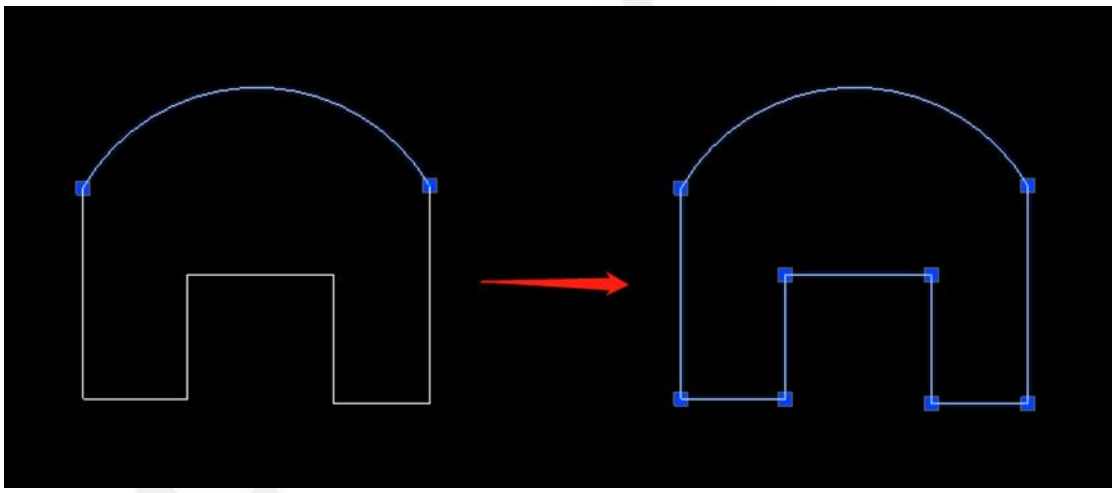


Figure: Merge Vector

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 that do not support merging are:

1. **Curved objects such as splines, elliptical arcs, and spirals.**
2. **Currently, arcs and 3D polylines are not supported for merging.**

Note: The merge function supports selecting mergeable vectors first, then clicking the merge button to merge the selected vectors.

2.4.6.15.2 Split

Function Description:

Draw a split line to split the selected vector into multiple parts.

Operation Steps:

① Click Vector -> Edit ->Advanced -> Split to activate split. Output message: Please select the split element first, click the right-click menu "Ok" or press the shortcut key Enter to end the selection.

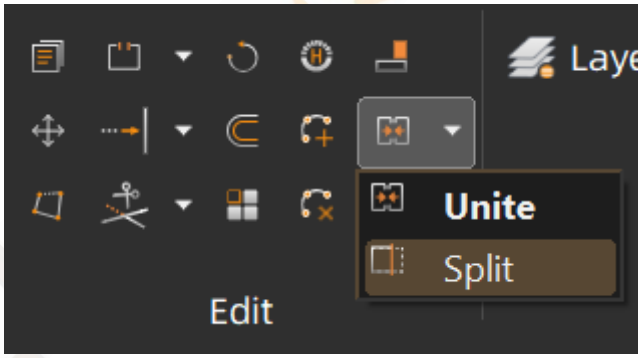


Figure: Split

② In the view, select the vector to be split (multiple selections are supported), and click the right-click menu "Ok" or press the shortcut key Enter to confirm the selection set.

③ Set parameters. Select "Only Split" to cut the object into multiple parts via clicking two point on the selected object; select "Generate New entities" to generate new entities via creating a split line from the split object.

④ Draw a polyline to split the entities, double-click to end and the split takes effec t. The selection set can be split multiple times.

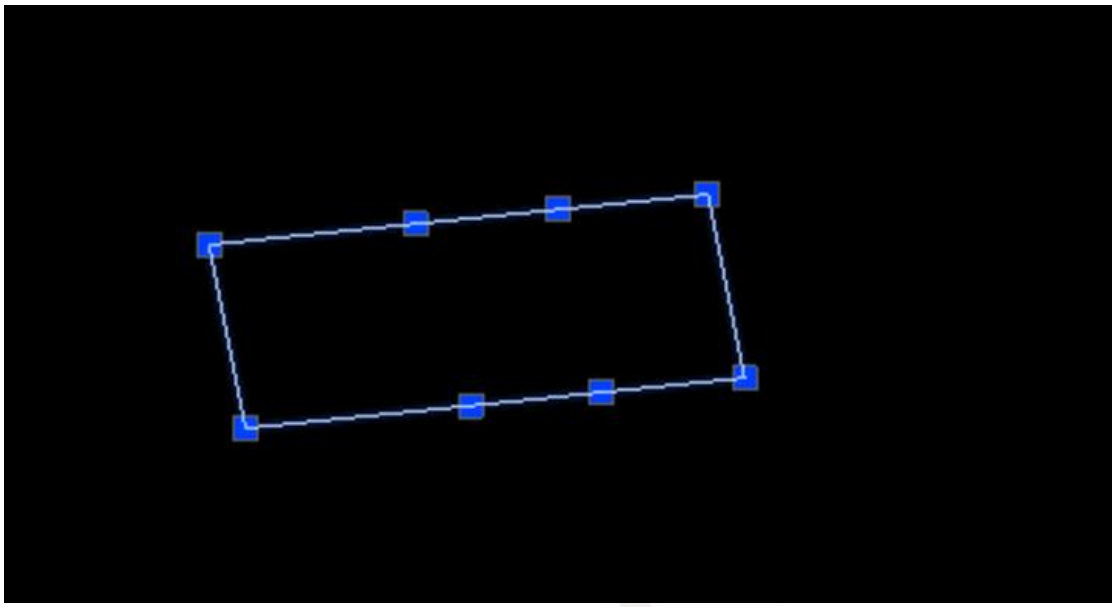


Figure: Split Only Result

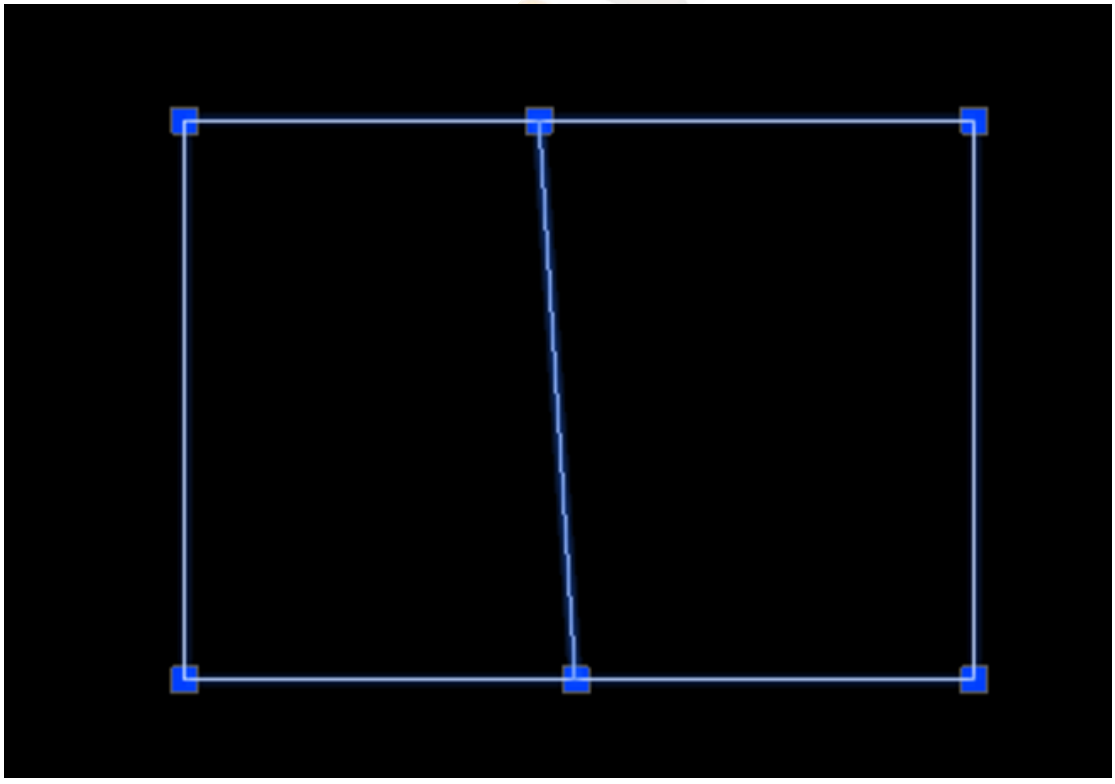


Figure: Generate New Entites Split Result

Note:

Objects that cannot be split are: points, blocks, groups, text, dimensions, and tables.

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

2.4.6.16 Vector Selection

2.4.6.16.1 Single Selection

Function Description:

Click to select the vector elements displayed in the view window.

Operation Steps:

① Use the left mouse button to click the vector in the view.

② When the clicked vector is in the active drawing and in an unlocked layer, the single selection effect is that the vector is highlighted and the points on the vector are displayed.

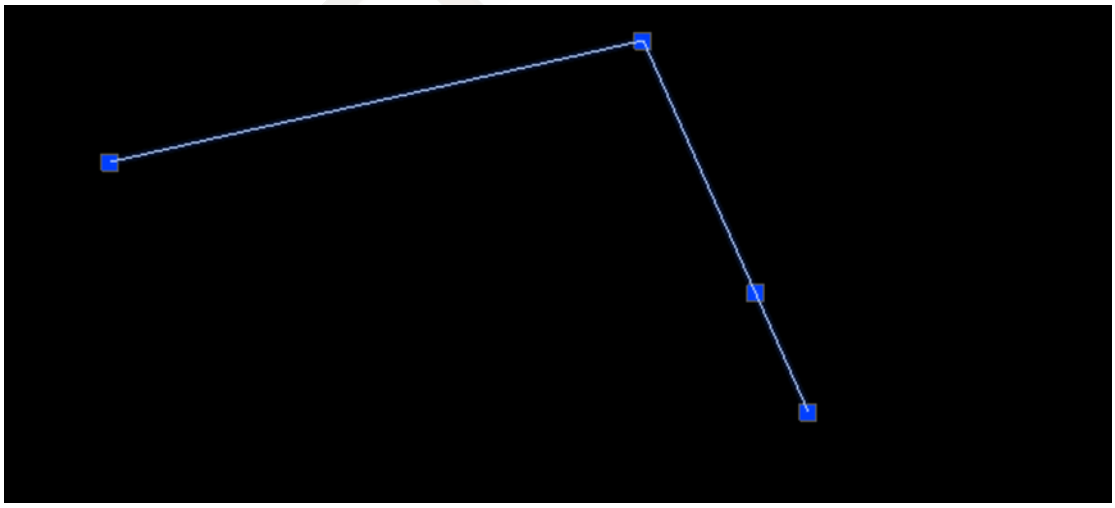


Figure: Single Selection

③ When the single-selected vector is in a non-active drawing or in a locked layer of the active drawing, the single selection effect is that the vector is highlighted, and the points on the vector are not displayed.

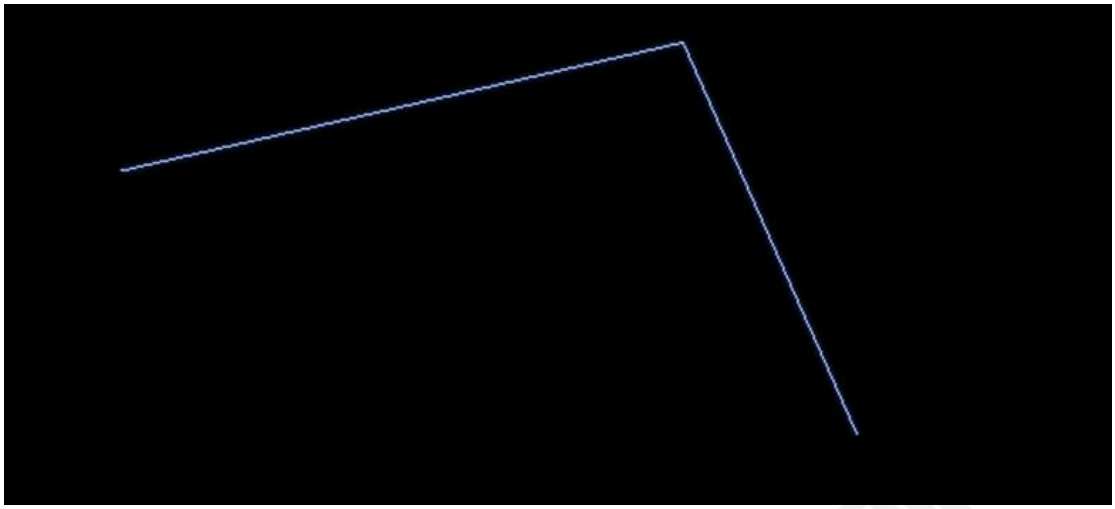


Figure: Single Selection of Vector in Non-Active Drawing or Locked Layer of Active Drawing

2.4.6.16.2 Selection Vector - Left to Right

① **Function Description:**

Draw a selection area from left to right, and use the selection area to completely cover the vectors in the view. The covered vectors are selected.

Operation Steps:

② Use the left mouse button to click a point on the left side of the vector, move t he mouse to the right to draw a selection area, so that the selection area complet ely covers the vector elements to be selected.

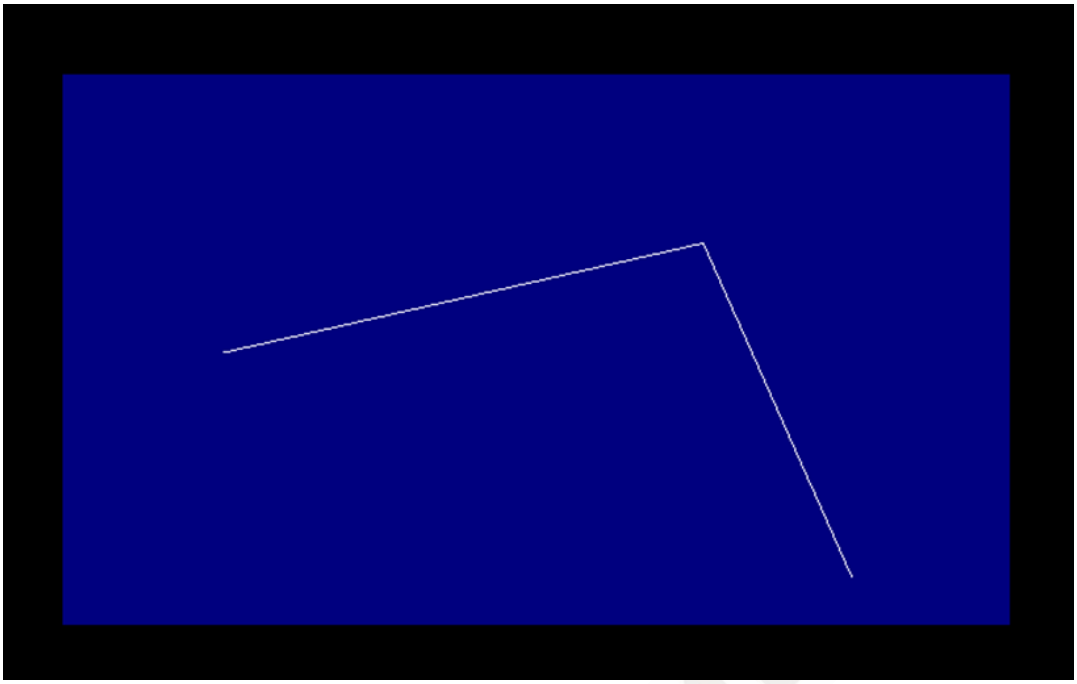


Figure: Selection Vector from Left to Right

③ Left-click the mouse to end the selection. When the vectors completely covered by the selection area are in the unlocked layer of the active drawing, the single selection effect is that the vectors are highlighted and the points on the vector are displayed; otherwise, only highlighted without displaying points.

2.4.6.16.3 Selection Vector- Right to Left

④ **Function Description:**

Draw a selection area from right to left, and use the selection area to partially or completely cover the vectors in the view. The covered vectors are selected.

Operation Steps:

⑤ Use the left mouse button to click a point on the right side of the vector, move the mouse to the left to draw a selection area, so that the selection area partially or completely covers the vector elements to be selected.

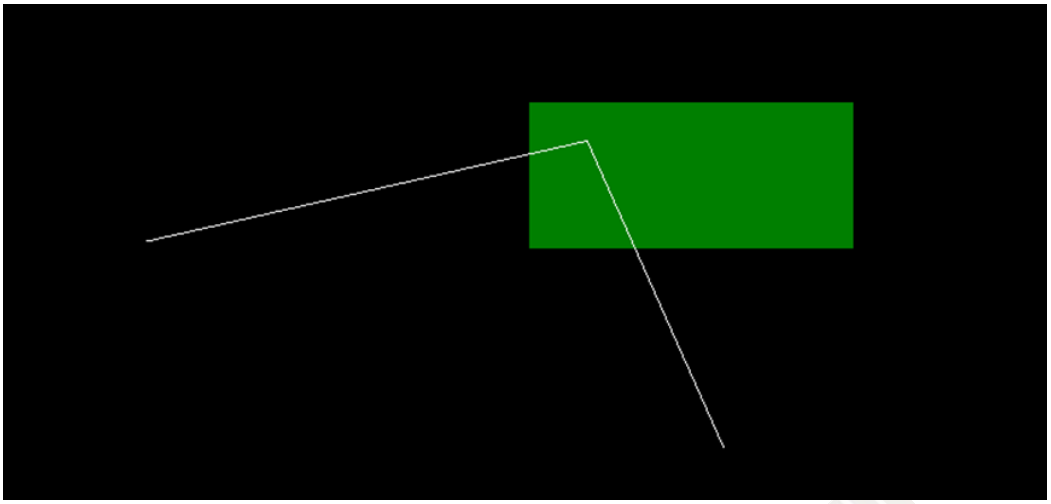


Figure:Selection Vector from Right to Left

① Left-click the mouse to end the selection. When the vectors partially or completel y covered by the selection area are in the unlocked layer of the active drawing, t he single selection effect is that the vectors are highlighted and the points on the vector are displayed; otherwise, only highlighted without displaying points.

2.4.6.16.4 Deselection

② **Function Description:**

Change a currently selected vector to an unselected state.

Operation Steps:

③ Shift + Single Selection: Hold down Shift, use the left mouse button to click the currently selected vector, and the vector will be deselected.

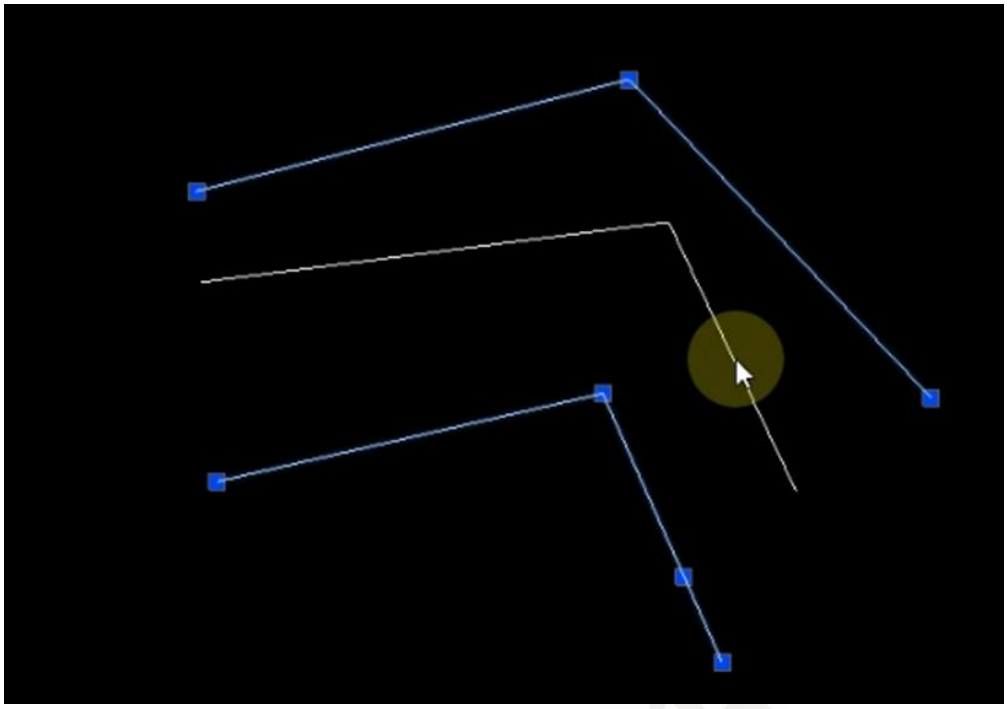


Figure: Deselection + Single Selection

④ Shift + Selection vector from Left to Right: Hold down Shift, use the left mouse button to click and drag to the right to window select. After the window selection range completely covers the selected vectors, left-click the mouse to end the window selection, and the selected vectors range will be deselected.

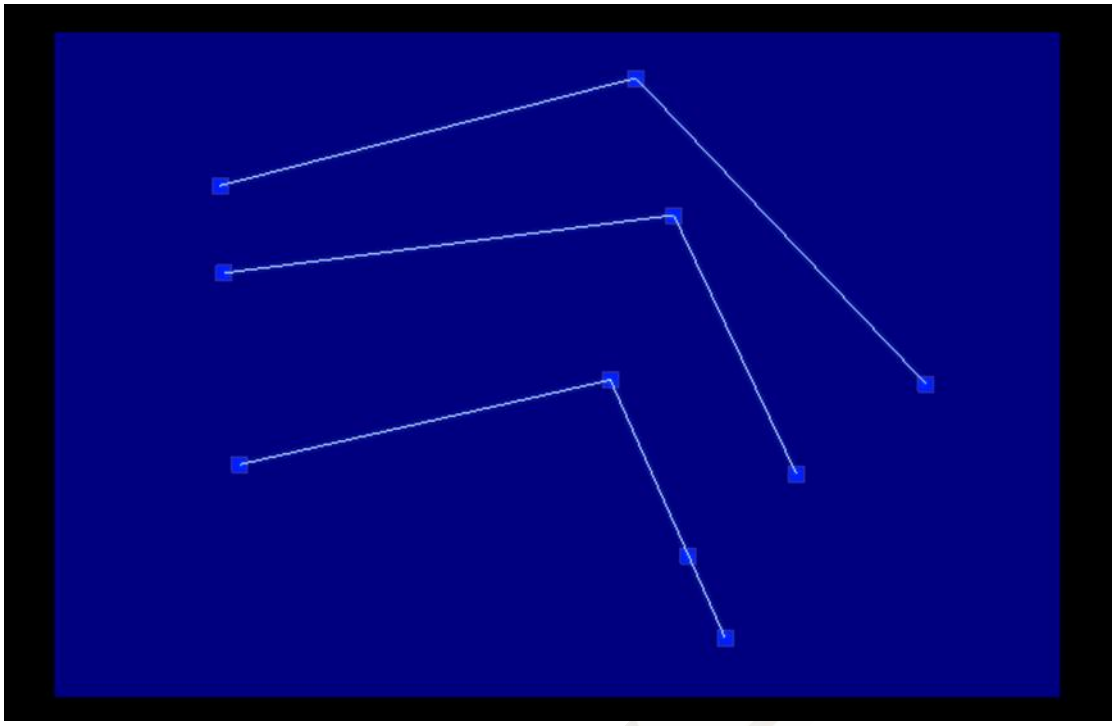


Figure: Deselection + Selection vector from Left to Right

⑤ Shift + Window Selection from Right to Left: Hold down Shift, use the left mouse button to click and drag to the left to window select. After the window selection range partially or completely covers the selected vectors, left-click the mouse to end the window selection, and the selected vectors partially or completely covered by the window selection range will be deselected.

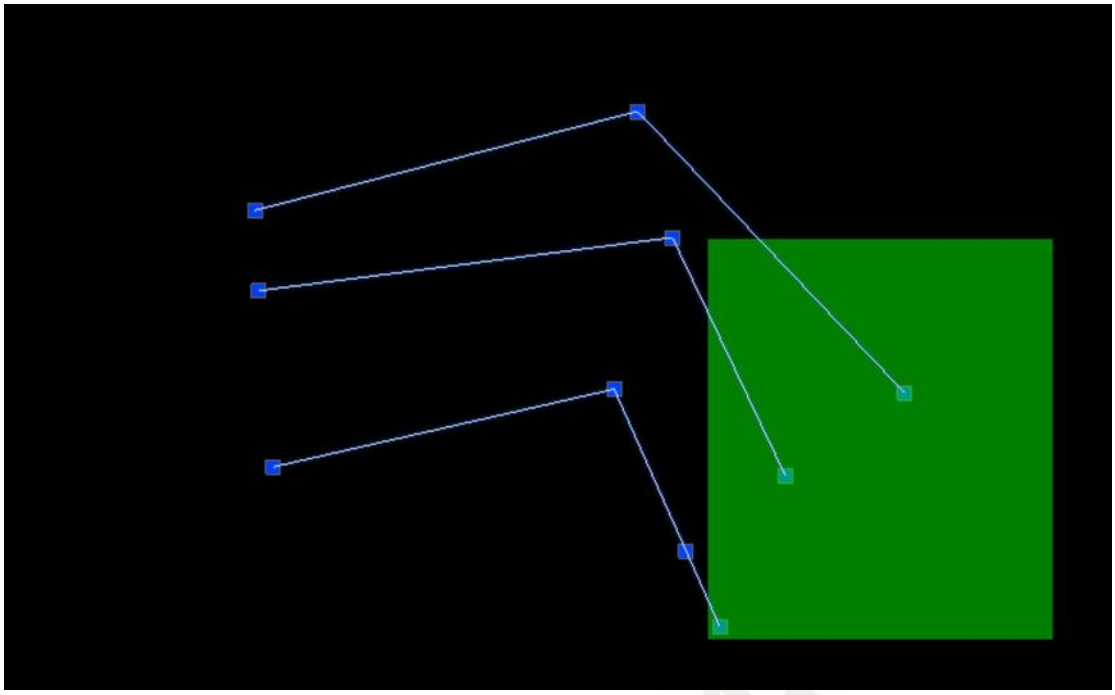


Figure: Deselection + Selection vector from Right to Left

2.4.6.17 Edit Hatch

Function Description:

Only when the hatch pattern is selected, the hatch edit panel pops up on the right side of the software, and the selected hatch pattern can be edited.

Operation Steps:

① Click to select the hatch pattern in the active drawing, and the "Edit Hatch" panel appears on the right side of the software.

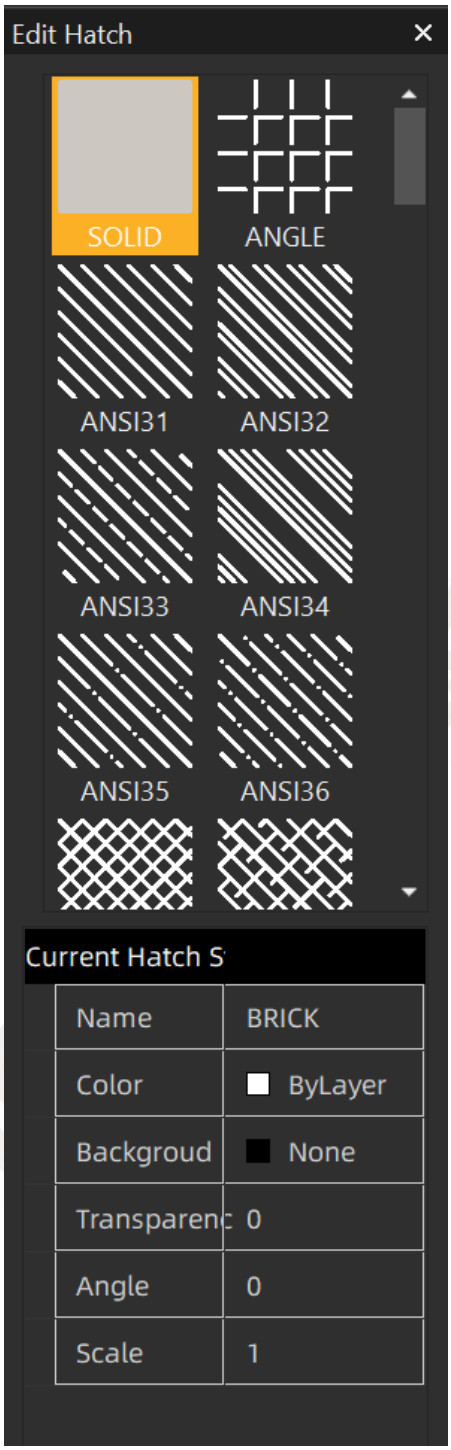


Figure: Edit Hatch Panel

② In the edit hatch panel, you can modify the style, color, background color, transparency, angle, and pattern scale attributes of the selected hatch vector.

Parameter Settings:

Scale: The scale of the hatch pattern, default is 1 (Standard). The larger the value, th e sparser the hatch pattern display; the smaller the value, the denser the hatch pattern display.

2.4.7 Layer

Function Description:

Layer management can view the layer's name, group, color, line type, line width, num ber of elements, transparency, description, display whether the vector is set to current, closed, frozen, and locked.

Operation Steps:

① Keep the layer manager existing in the software;

② Click the layer button to pop up the layer manager dialog box;

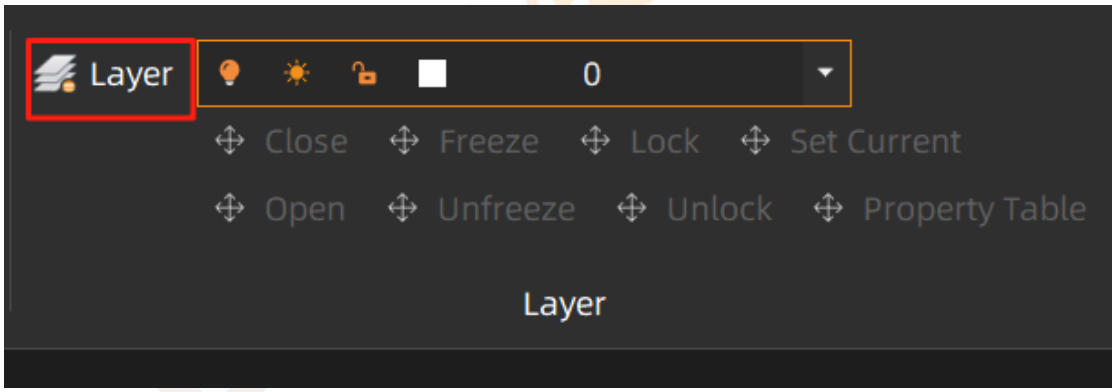


Figure: Open Layer Manager

③ In the layer manager, you can create a new layer, delete a layer, set as current, delete all layers except layer 0, select all elements in the selected layer, clear all elements in the selected layer, select empty layers, display empty layers, rename l ayers, open/close layers, freeze/thaw layers, lock/unlock layers.

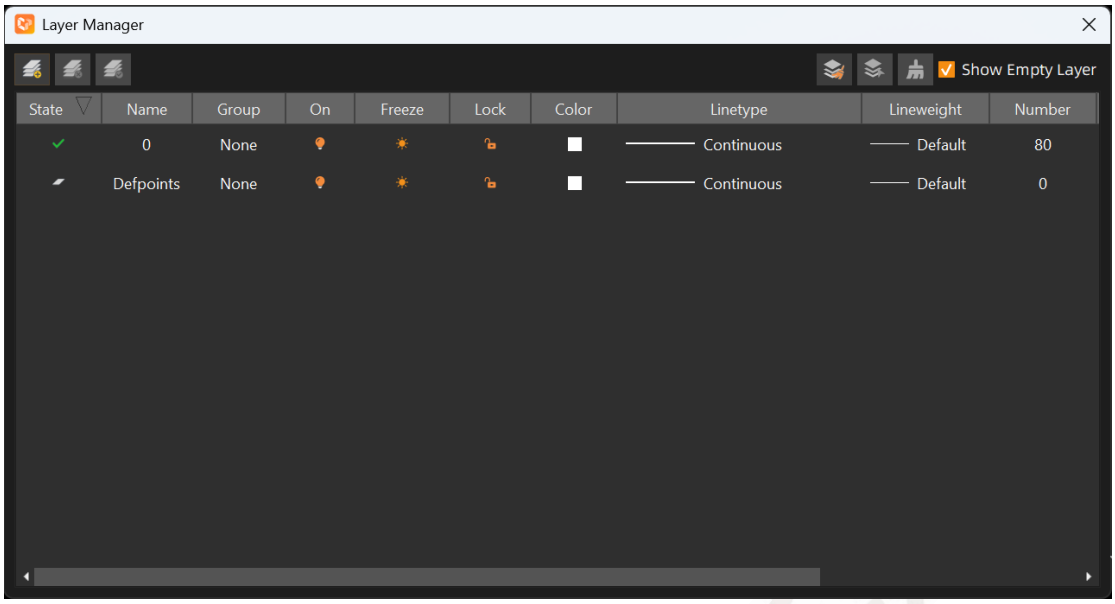


Figure: Layer Manager List

2.4.7.1 Layer Manager

Function Description:

The functions above the layer list from left to right are: New Layer, Delete Layer, Activate Layer, Delete All Layers Except Layer 0, Select All Entities in Selected Layer, Clear All Entities in Selected Layer, Show Empty Layers.

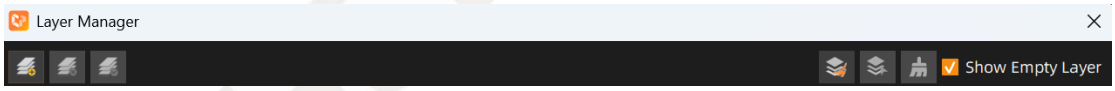


Figure: Layer Manager

Operation Steps:

Left-click the button to implement the corresponding function.

2.4.7.1.1 New Layer

Function Description:

Create a new layer.

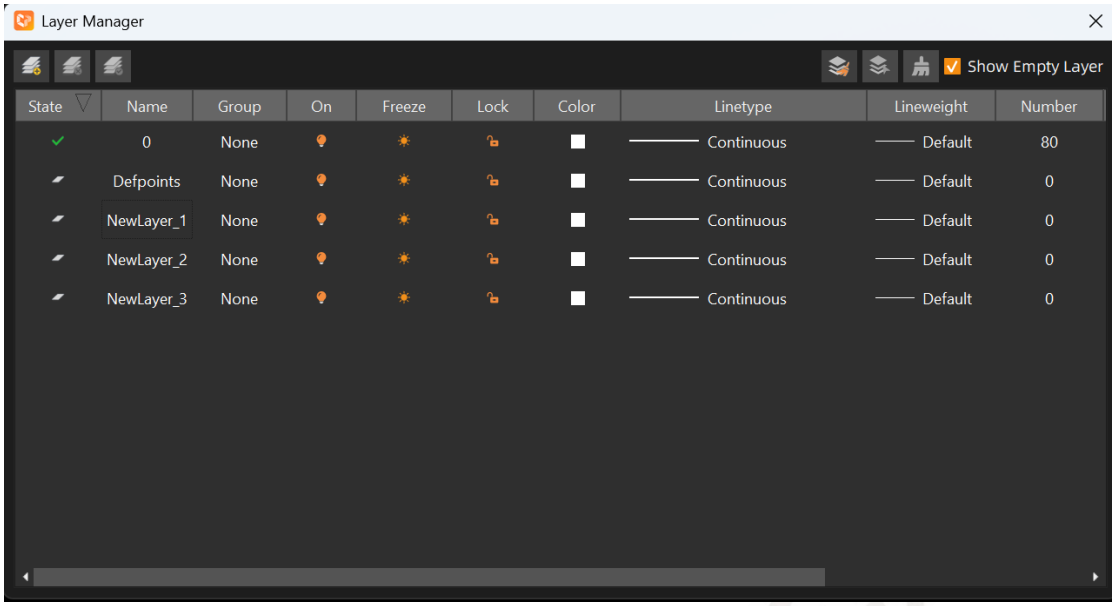


Figure: New Layer

Operation Steps:

Left-click New Layer, and the new layer is created at the bottom of the layer list.

2.4.7.1.2 Delete Layer

Function Description:

Delete an existing layer.

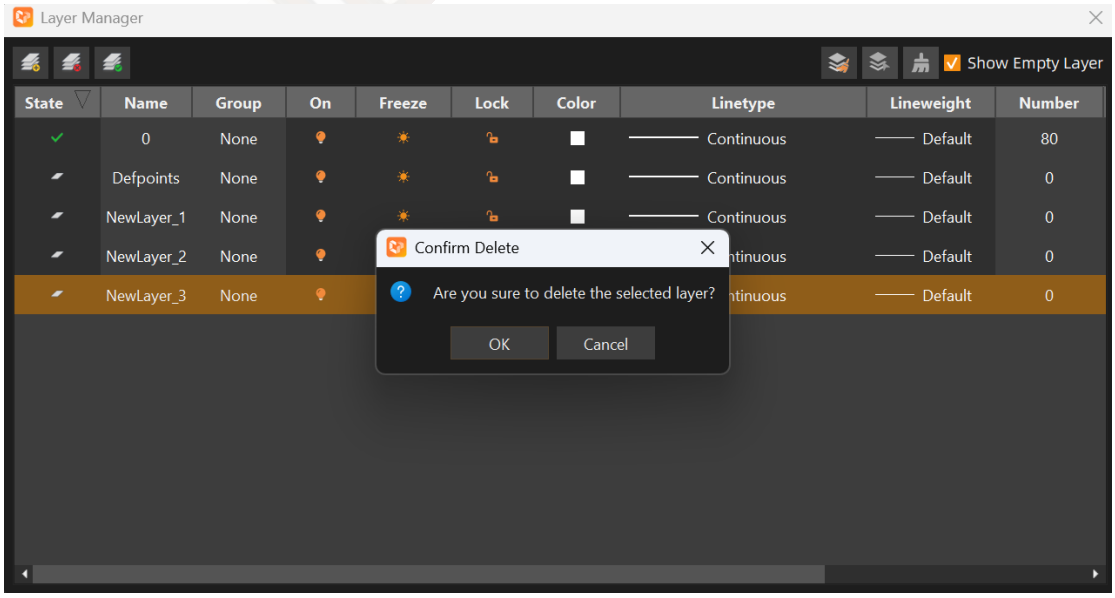


Figure: Delete Layer

Operation Steps:

Select the layer in the list, left-click Delete Layer, select OK in the pop-up message window, and the selected layer is deleted (layer 0 and the current layer cannot be del eted).

2.4.7.1.3 Activate Layer

Function Description:

Set a non-current layer as the current layer.

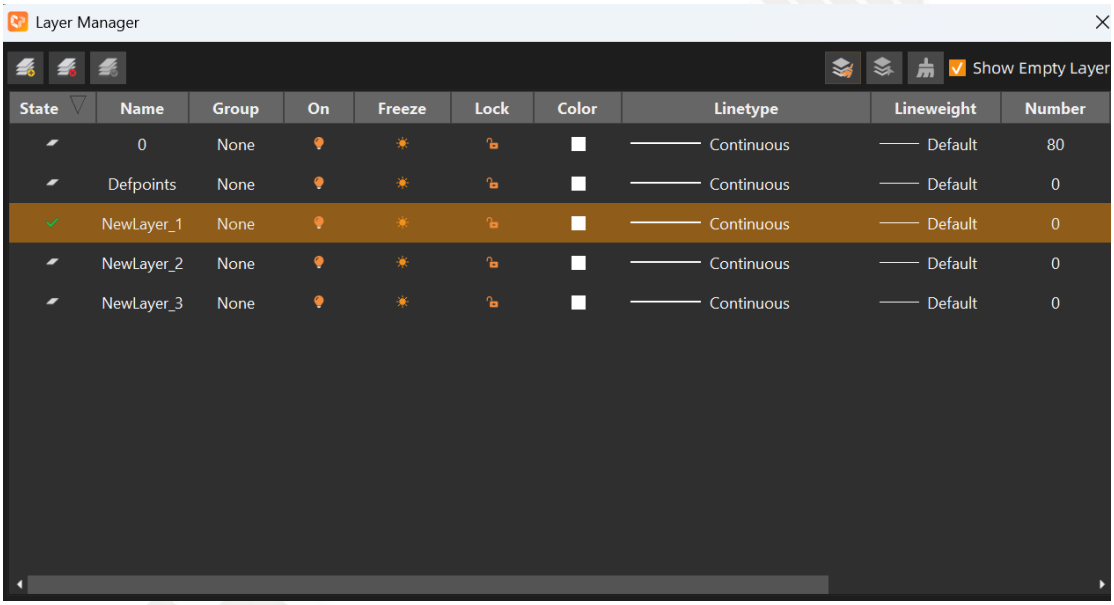


Figure: Activate Layer

Operation Steps:

Select the layer in the list, left-click Acticate Layer, the selected layer is set as the c urrent layer, and the status of the layer becomes checked.

2.4.7.1.4 Delete All Layers Except For Layer 0

Function Description:

Delete all layers except layer 0 and the current layer.

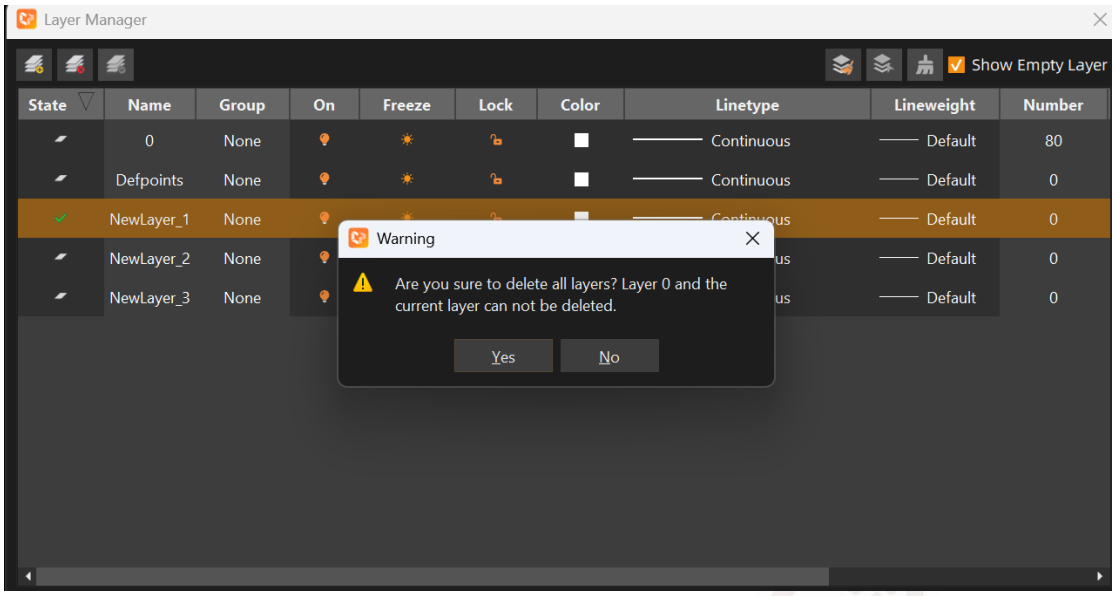


Figure: Delete All Layers Except Layer 0 and Current Layer

Operation Steps:

Left-click the Delete All Layers Except Layer 0 button, select Yes in the pop-up mess age window, and layers other than the current layer and layer 0 are deleted.

2.4.7.1.5 Select All Entities in Selected Layer

Function Description:

Select all elements in the selected layer.

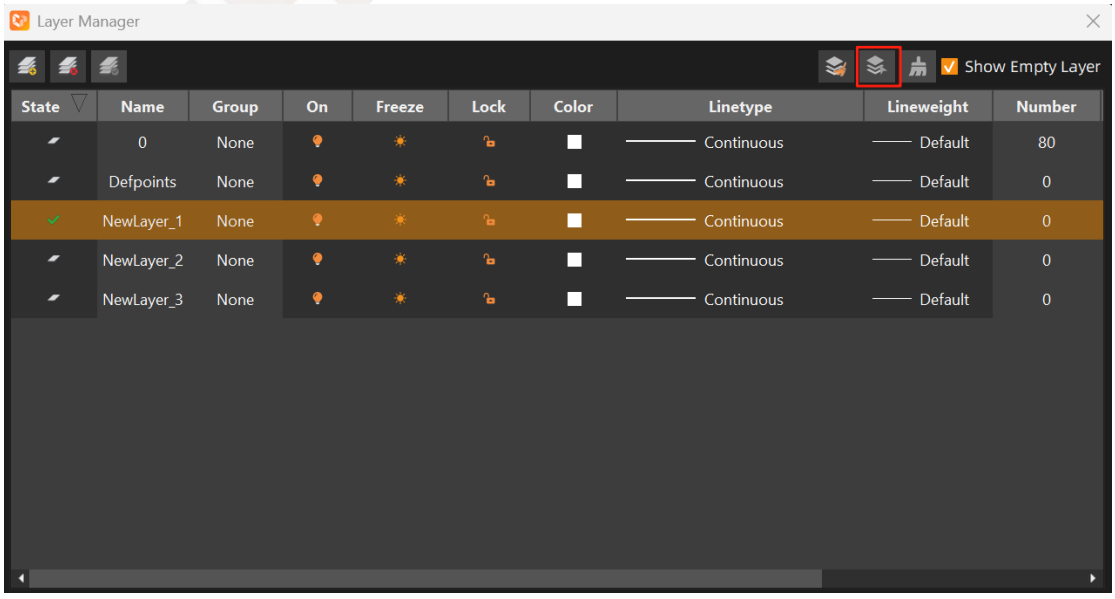


Figure: Select All Entities in Selected Layer

Operation Steps:

Select the layer in the list, left-click the Select All Entities in Selected Layer button, and all elements in the layer are selected.

2.4.7.1.6 Clear All Entities in Selected Layer

Function Description:

Delete all elements in the selected layer.

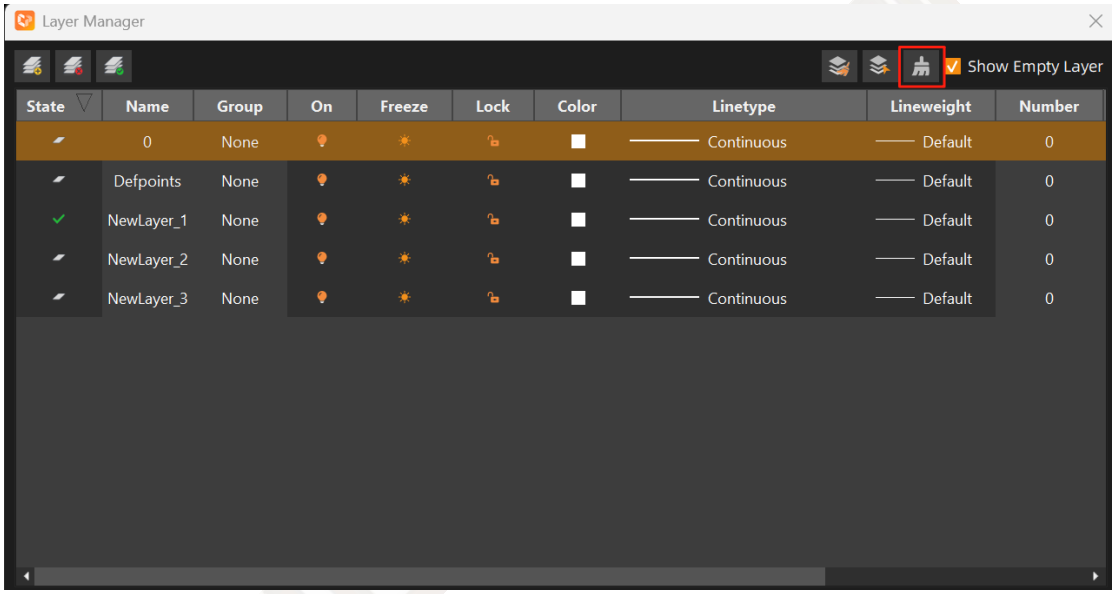


Figure: Clear All Entities in Selected Layer

Operation Steps:

Select the layer in the list, left-click the Clear All Entities in Selected Layer button, a nd all elements in the layer are deleted.

2.4.7.1.7 Show Empty Layer

Function Description:

Display layers with 0 elements in the drawing (layer 0 will not be hidden).

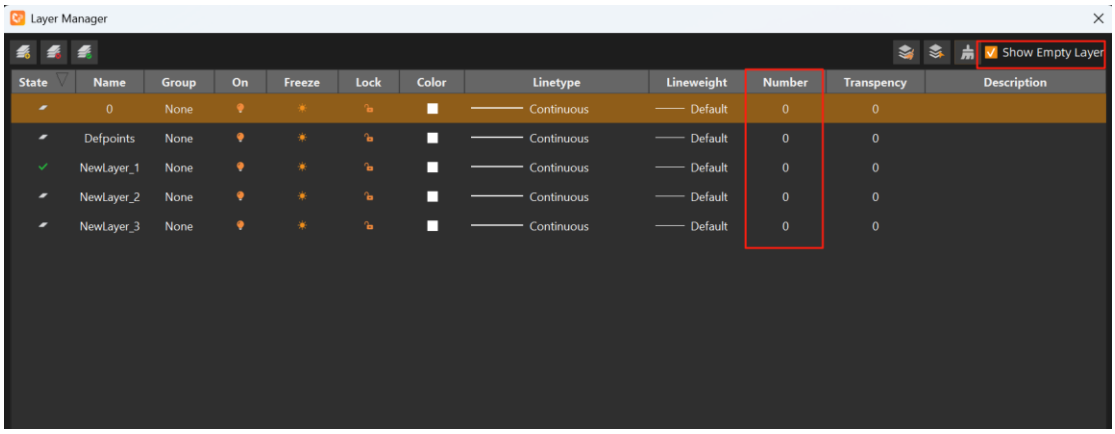


Figure: Show Empty Layer

Operation Steps:

Left-click to check the Show Empty Layers checkbox to display layers with 0 elements in the drawing.

2.4.7.2 Right-Click Menu of Layer List

Function Description:

The functions of the right-click menu of the layer list from top to bottom are: Show Empty Layers, Activate Layer, New Layer, Rename Layer, Delete Layer, Freeze All Layers, Unfreeze All Layers, Open All Layers, Close All Layers, Select Empty Layers, Select Non-Empty Layers, Select Layer Entities, Clear Layers, Clear Selected Layer Entities.

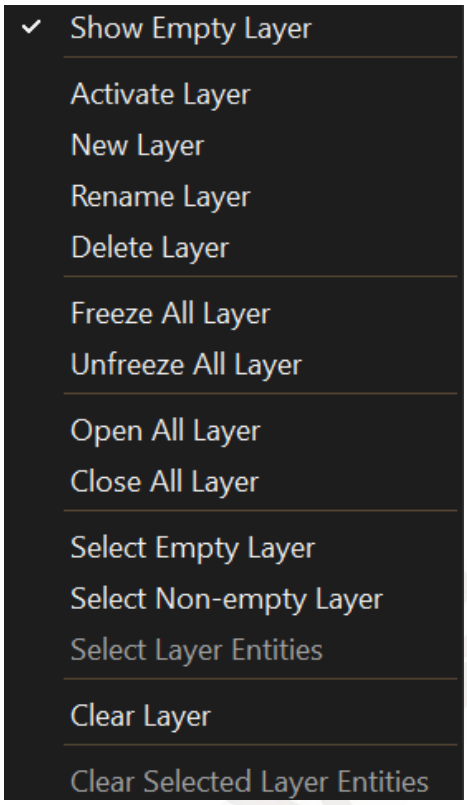


Figure: Right-Click Menu of Layer List

Operation Steps:

Right-click the layer list to pop up the menu, and left-click to select the function to execute.

2.4.7.2.1 Show Empty Layers

Function Description:

Display layers with 0 elements in the drawing.

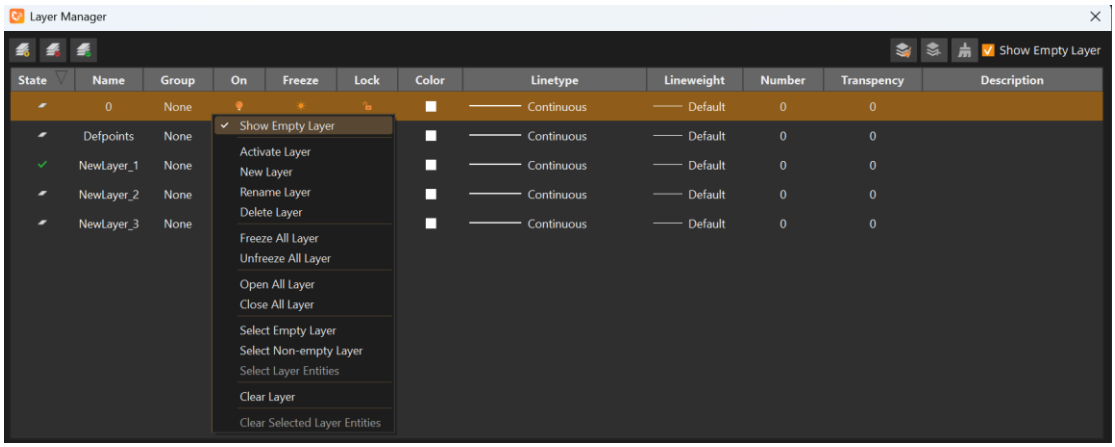


Figure: Show Empty Layers

Operation Steps:

Left-click Show Empty Layers to display layers with 0 elements in the drawing.

2.4.7.2.2 Activate Layer

Function Description:

Set a non-current layer as the current layer.

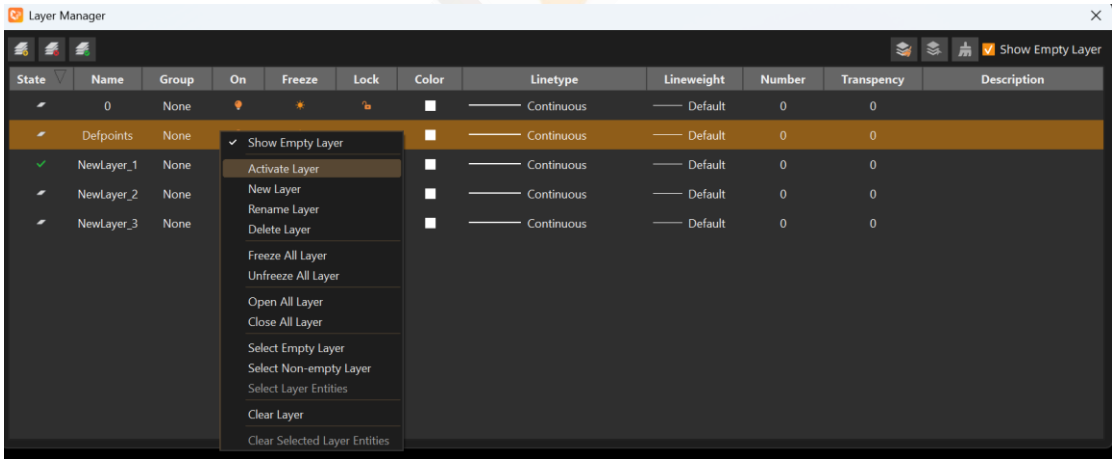


Figure: Activate Layer

Operation Steps:

Select the layer in the list, right-click to pop up the menu, left-click Select Set as Cu rrent, and the status of the layer becomes checked (when the current layer is selected by right-click, the Activate Layer in the right-click menu is disabled).

2.4.7.2.3 New Layer

Function Description:

Create a new layer.

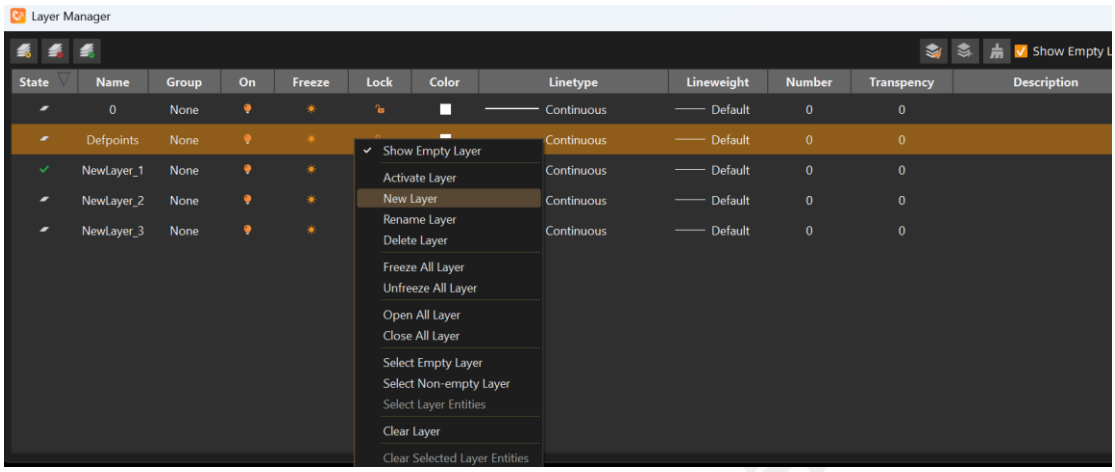


Figure: New Layer

Operation Steps:

Left-click Select New Layer, and the new layer is created at the bottom of the layer list.

2.4.7.2.4 Rename Layer

Function Description:

Rename the layer.

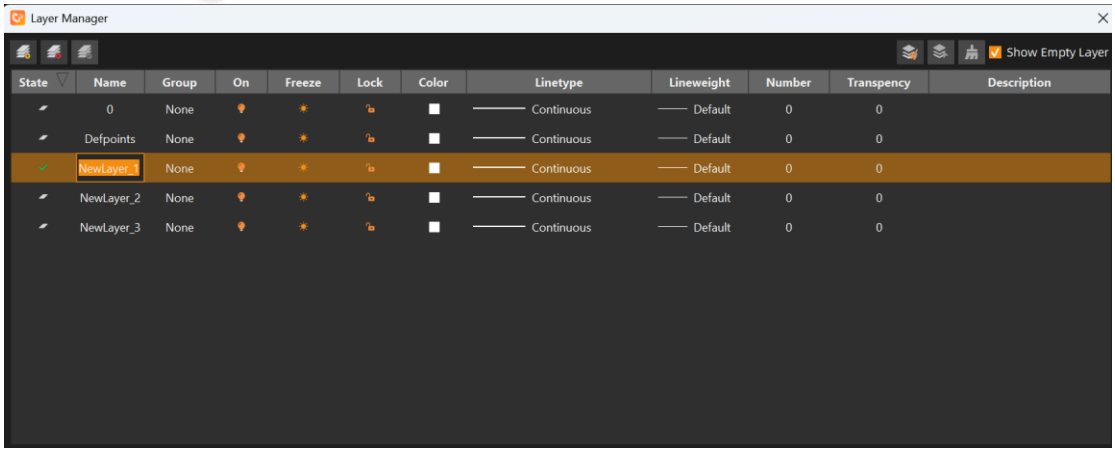


Figure: Rename Layer

Operation Steps:

Select the layer to be renamed, right-click to pop up the menu, select Rename Layer, the layer name becomes editable, and you can enter a name to rename the layer.

2.4.7.2.5 Delete Layer

Function Description:

Delete an existing layer.

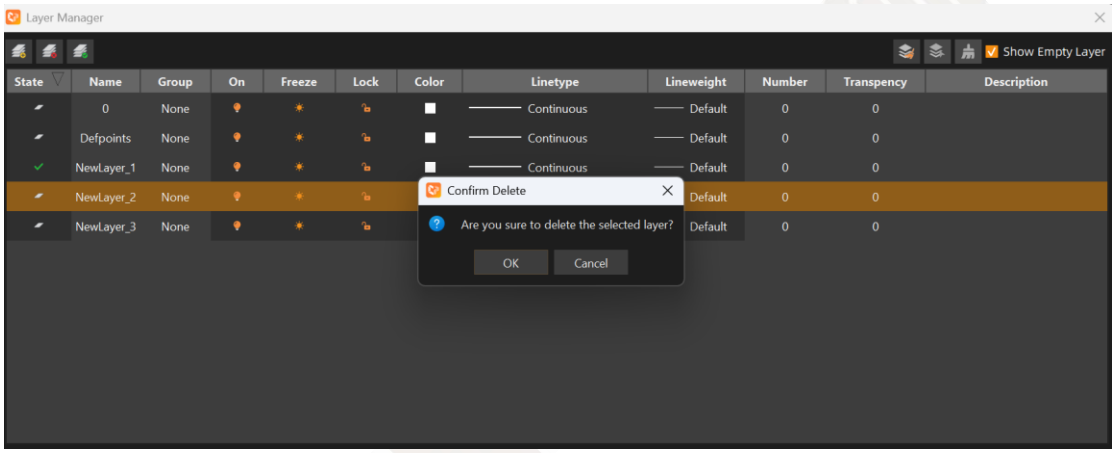


Figure: Delete Layer

Operation Steps:

Select the layer in the list, right-click to pop up the menu, left-click Delete Layer, sel ect OK in the pop-up message window, and the selected layer is deleted.

2.4.7.2.6 Freeze All Layer

Function Description:

Freeze all layers except the current layer.

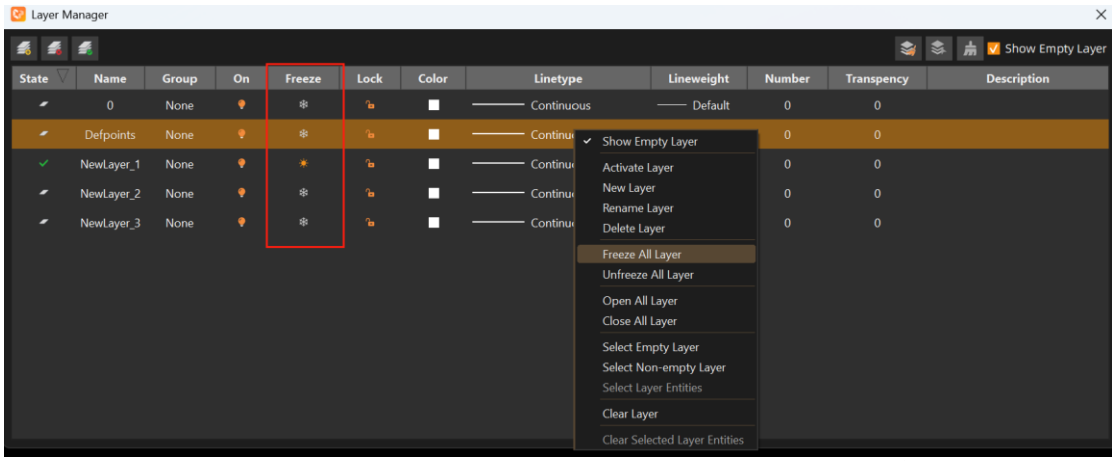


Figure: Freeze All Layer

Operation Steps:

Right-click in the layer list to pop up the menu, left-click Freeze All Layer, all layers except the current layer are frozen, and the freeze column attribute becomes a gray snowflake.

2.4.7.2.7 Unfreeze All Layer

Function Description:

Unfreeze all layers.

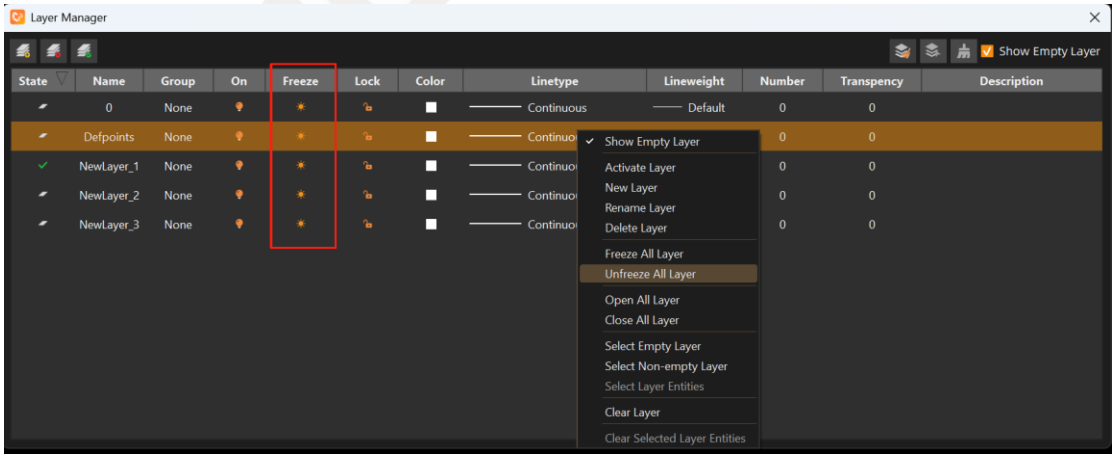


Figure: Unfreeze All Layer

Operation Steps:

Right-click in the layer list to pop up the menu, left-click Unfreeze All Layer, all lay

ers are unfreezed, and the freeze column attribute becomes an orange sun.

2.4.7.2.8 Open All Layer

Function Description:

Open all layers.

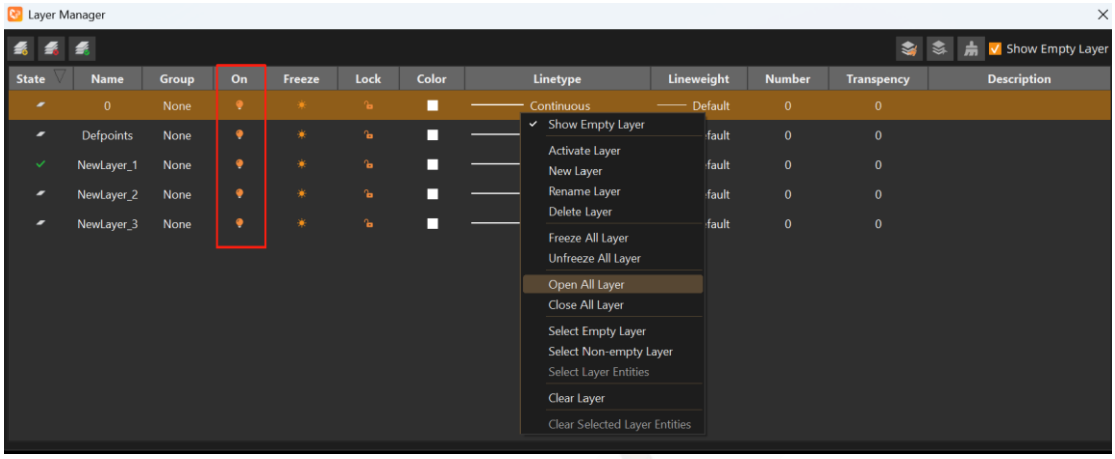


Figure: Open All Layer

Operation Steps:

Right-click in the layer list to pop up the menu, left-click Open All Layer, all layers are opened, and the open column attribute becomes an orange light bulb.

2.4.7.2.9 Close All Layer

Function Description:

Close all layers.

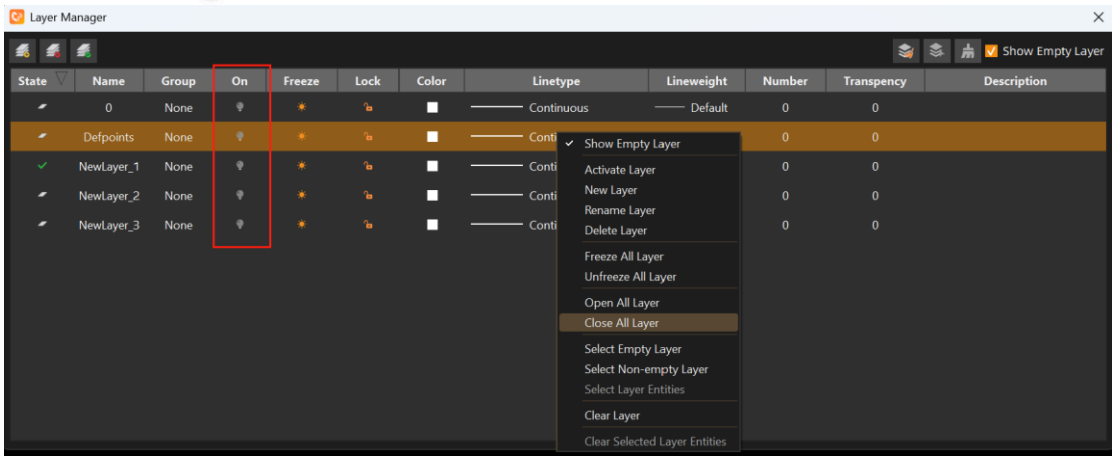


Figure: Close All Layer

Operation Steps:

Right-click in the layer list to pop up the menu, left-click Close All Layer, all layers are closed, and the open column attribute becomes a gray light bulb.

2.4.7.2.10 Select Empty Layer

Function Description:

Select all empty layers.

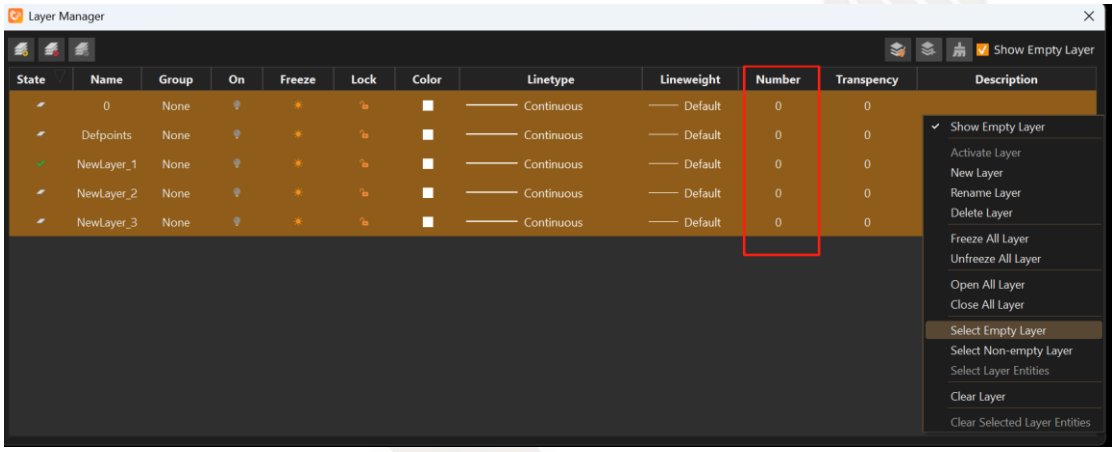


Figure: Select Empty Layer

Operation Steps:

Right-click in the layer list to pop up the menu, left-click Select Empty Layer, and al l empty layers are selected.

Note: You need to check the Show Empty Layer first.

2.4.7.2.11 Select Non-Empty Layer

Function Description:

Select all non-empty layers.

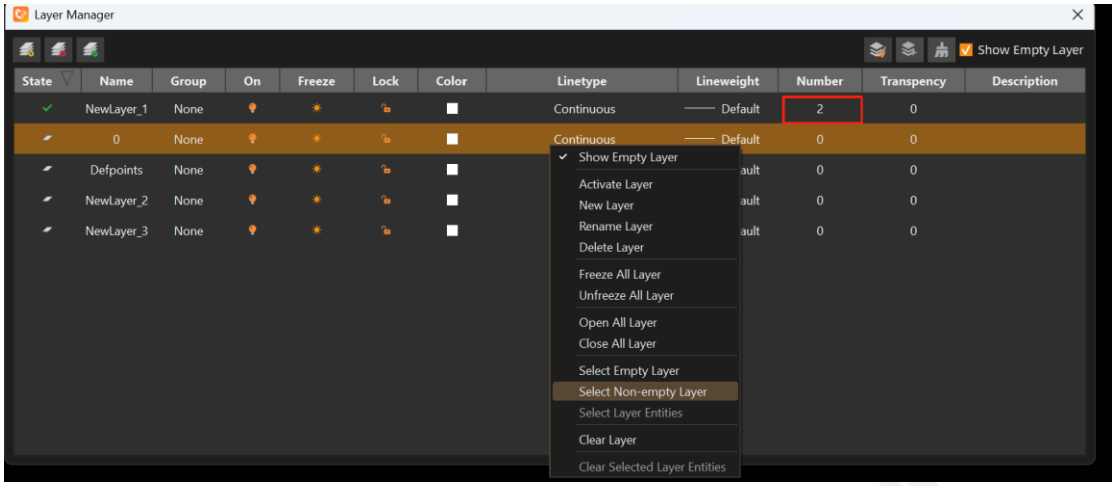


Figure: Select Non-Empty Layer

Operation Steps:

Right-click in the layer list to pop up the menu, left-click Select Non-Empty Layers, and all non-empty layers are selected.

2.4.7.2.12 Select Layer Entities

Function Description:

Select all elements in the selected layer.

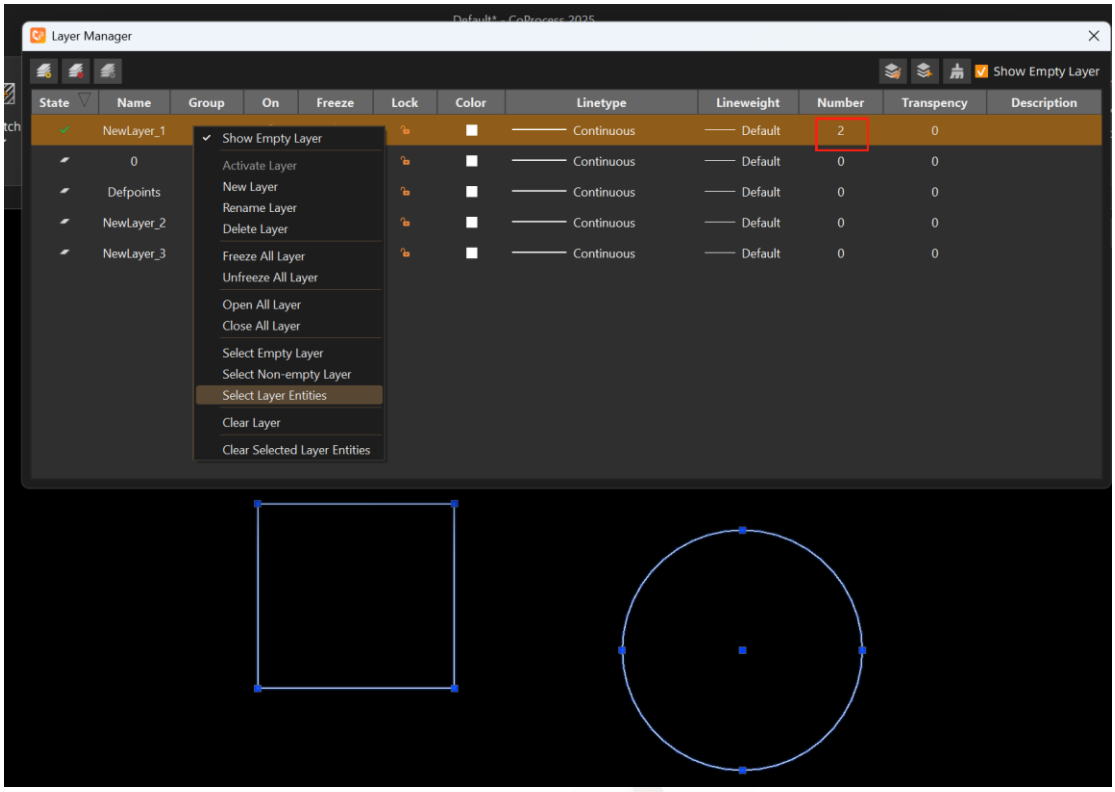


Figure: Select Layer Entities

Operation Steps:

Select the layer in the list, left-click the "Select Layer Entities" button, and all elemen ts in the layer will be selected.

2.4.7.2.13 Clear Layer

Function Description:

Deletes all layers except Layer 0 and the current layer.

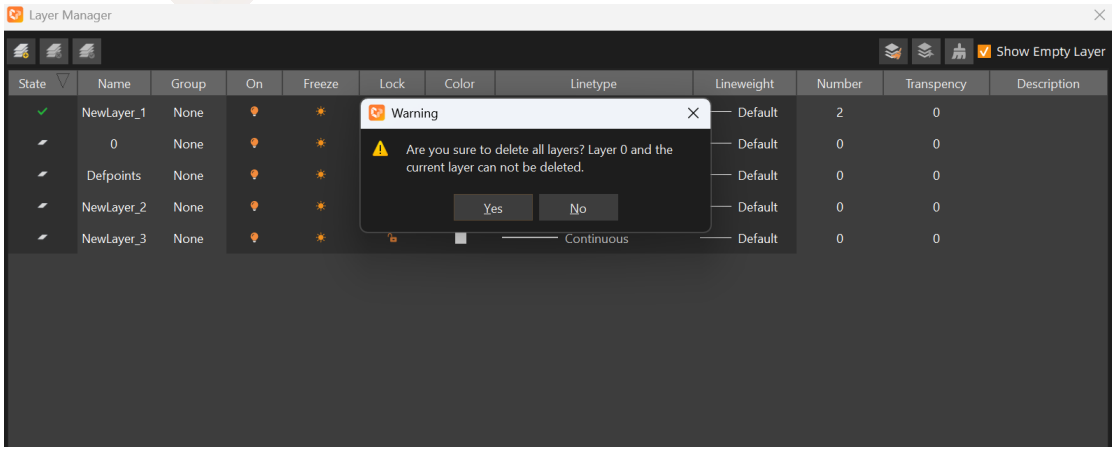


Figure: Clear Layer

Operation Steps:

Right-click in the layer list to open the context menu, left-click the "Clear Layer" button, select "Yes" in the pop-up message window, and all layers except the current layer and Layer 0 will be deleted.

2.4.7.2.14 Clear Selected Layer Entities

Function Description:

Delete all elements in the selected layer.

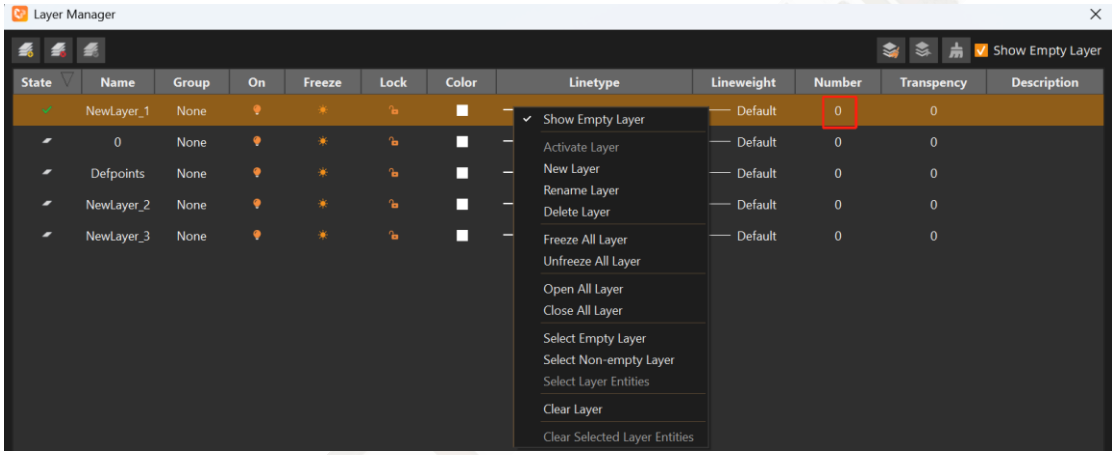


Figure: Clear Selected Layer Entities

Operation Steps:

Select the layer in the list, right-click to bring up the menu, and left-click the "Clear Selected Layer Entities" button to delete all elements in the layer.

2.4.7.3 Layer Drop-down Box

Function Description:

Quickly modify the current layer and the switch, freeze, lock status of the layer through the layer drop-down box in the layer menu, and also set the layer color.

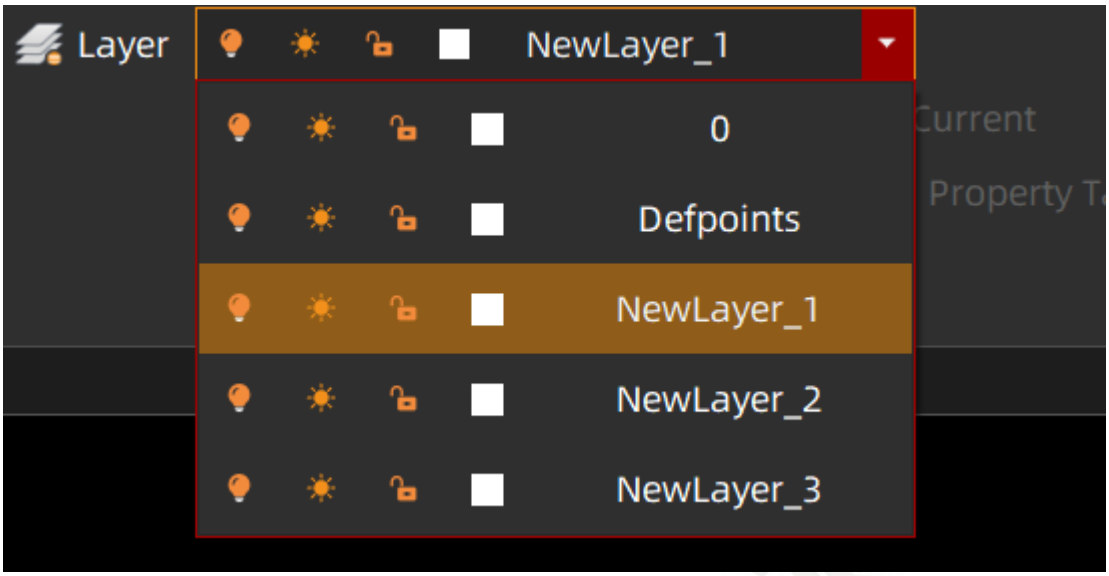


Figure: Layer Drop-down Box

Operation Steps:

Left-click the layer drop-down box in the layer toobar to display the list.

2.4.7.3.1 Switch

Function Description:

Quickly adjust the on/off status of a certain layer during vector drawing and editing.

Operation Steps:

Click Vector -> Layer Drop-down Box -> Layer Switch Button to adjust the on/off st atus of the corresponding layer.

When the button is orange highlighted, it indicates that the layer is currently in the e nabled state; when the button is not highlighted, it indicates that the layer is currently in the disabled state. When the layer is disabled, all vectors in the layer are invisibl e and unselectable in the view window, but vectors can be modified to the disabled l ayer through the property panel, and the disabled layer can also be set as the current layer.

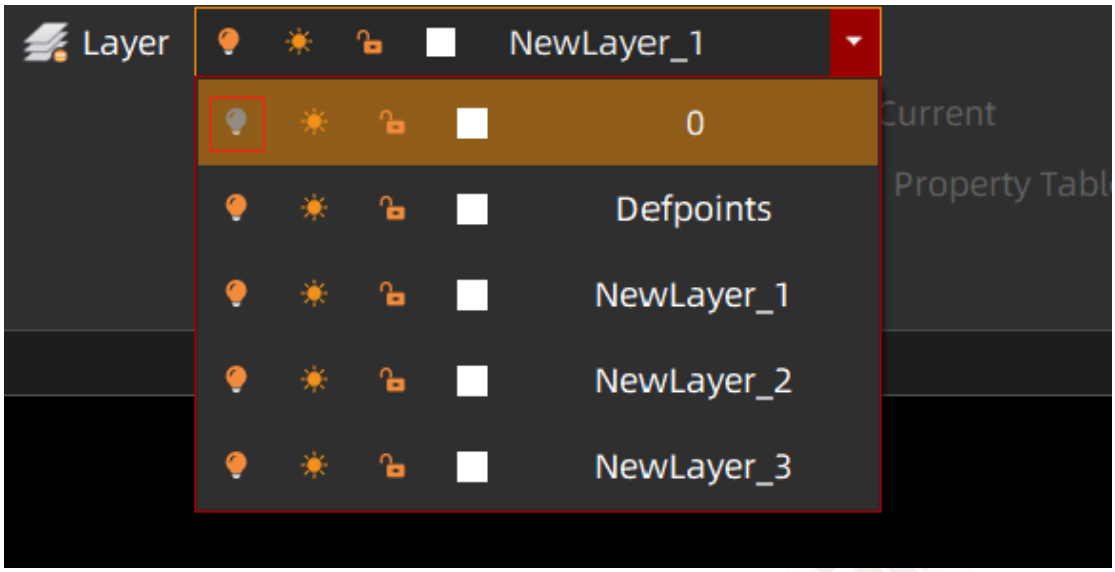


Figure: Layer On/Off in Layer Drop-down Box

2.4.7.3.2 Freeze

Function Description:

Quickly adjust the freeze status of a certain layer during vector drawing and editing.

Operation Steps:

Click Vector -> Layer Drop-down Box -> Layer Freeze Button to adjust the unfrozen and frozen status of the corresponding layer.

When the button is an orange sun, it indicates that the layer is currently in the unfro zen state; when the button is a grey snowflake, it indicates that the layer is currently in the frozen state. When the layer is frozen, all vectors in the layer are invisible and unselectable in the view window, and vectors cannot be modified to the frozen layer through the property panel, and the current layer cannot be frozen.

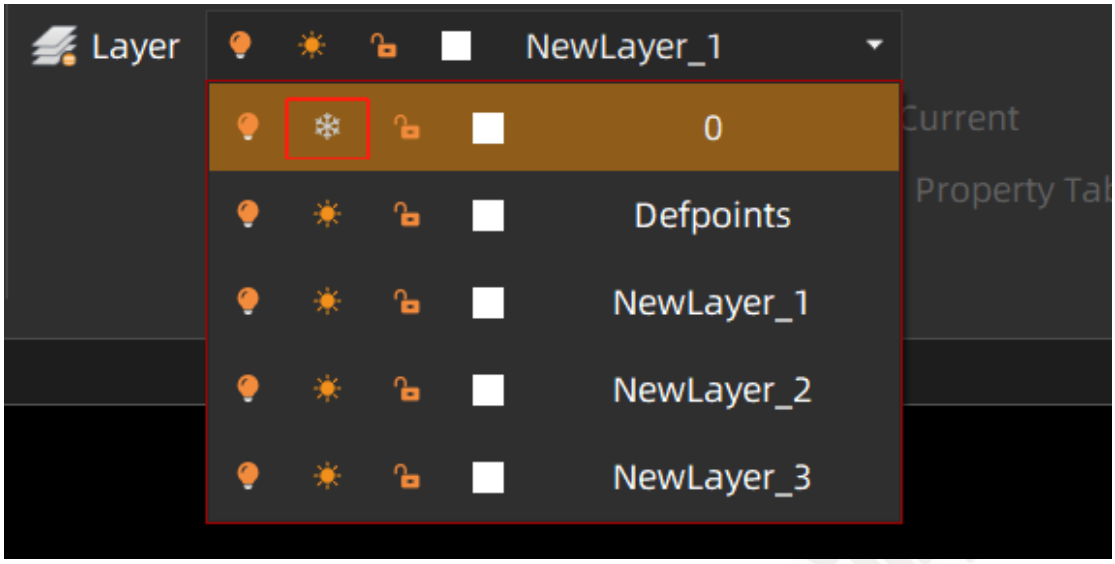


Figure: Layer Freeze in Layer Drop-down Box

2.4.7.3.3 Lock

Function Description:

Quickly adjust the lock status of a certain layer during vector drawing and editing.

Operation Steps:

Click Vector -> Layer Drop-down Box -> Layer Lock Button to adjust the unlocked and locked status of the corresponding layer.

When the button is an orange unlocked lock, it indicates that the layer is currently in the unlocked state; when the button is a dark locked lock, it indicates that the layer is currently in the locked state. When the layer is locked, all vectors in the layer are visible (with darker colors) and selectable in the view window. The locked layer can also be set as the current layer, but vectors cannot be modified to the locked layer th rough the property panel.

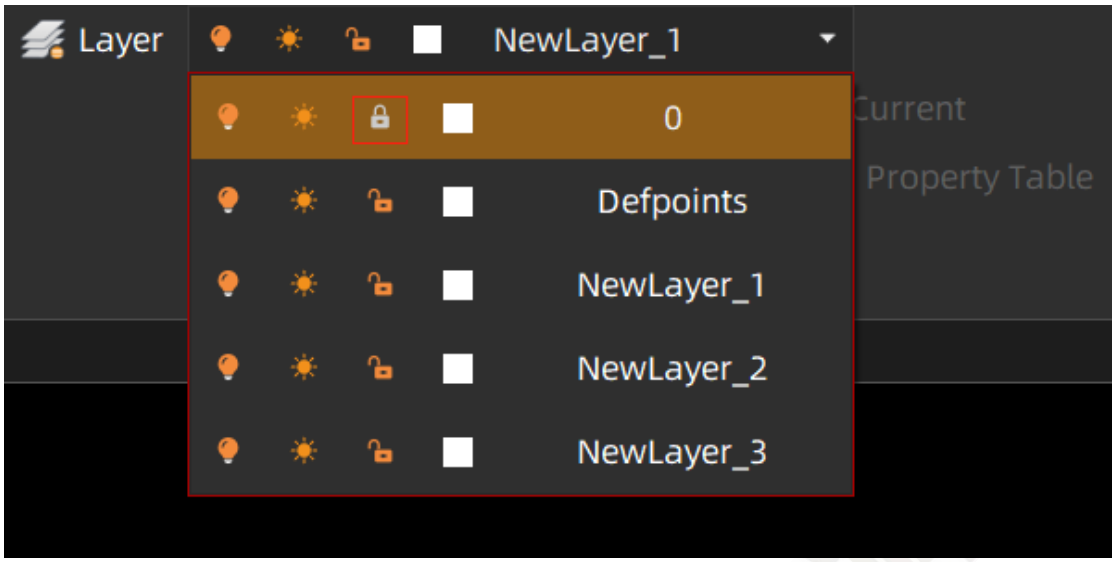


Figure: Layer Lock in Layer Drop-down Box

2.4.7.3.4 Color

Function Description:

Quickly adjust the color attribute of a certain layer during vector drawing and editing.

Operation Steps:

Click Vector -> Layer Drop-down Box -> Color, and after the color picker pops up, s elect the desired color in the color picker and click OK, and the corresponding layer will change to the modified color.

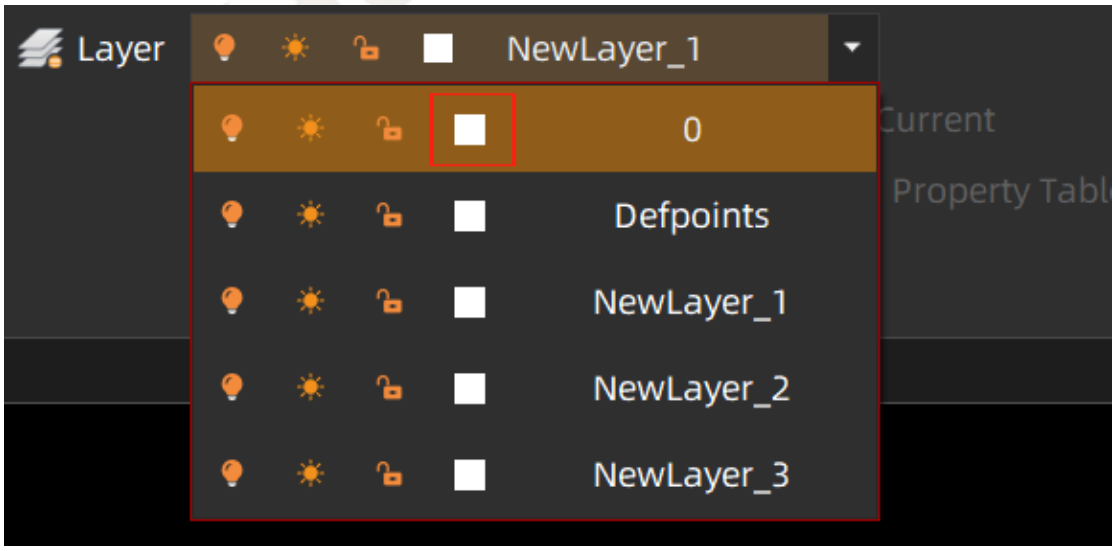


Figure: Layer Color in Layer Drop-down Box

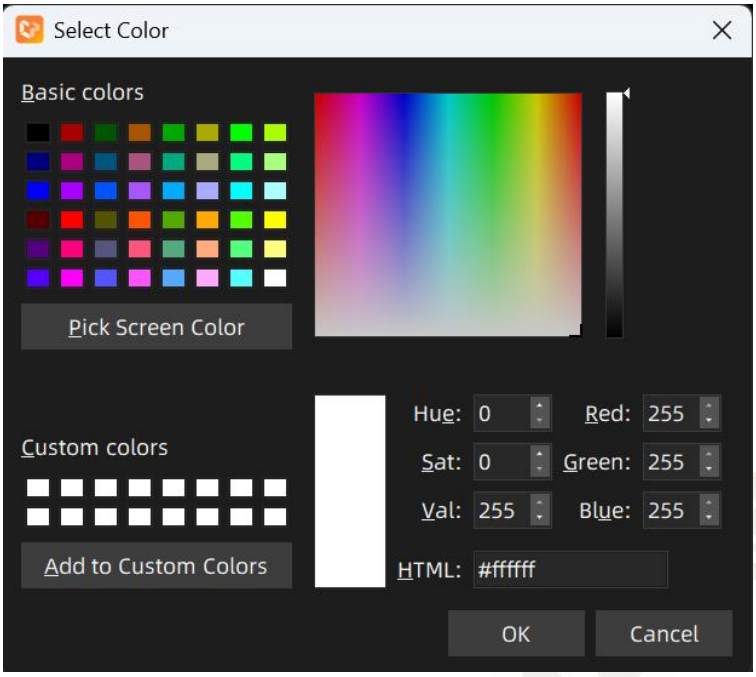


Figure: Color Picker

2.4.7.3.4 Current Layer

Function Description:

Quickly adjust the current layer during vector drawing and editing.

Operation Steps:

Click Vector -> Layer Drop-down Box -> Layer Name, and click the layer name position to set the clicked layer as the current layer (a frozen layer cannot be set as the current layer), and new vectors will be drawn in the current layer.

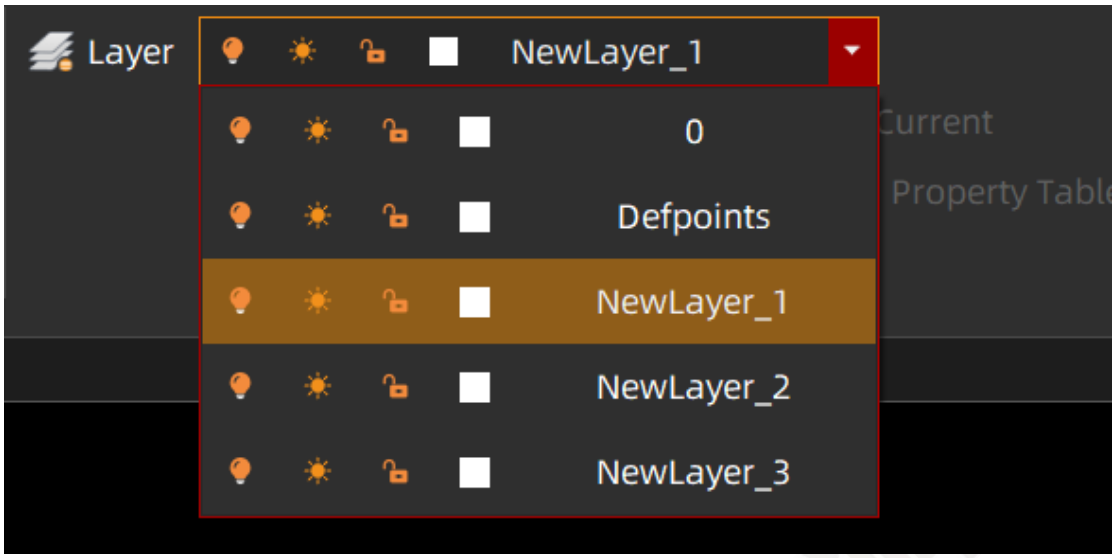


Figure: Set as Current Layer

2.4.8 Template

2.4.8.1 Block

Function Description:

Use existing templates to draw in the drawing.

Operation Steps:

 Click Vector -> Template -> Block to pop up the block table panel, and click to s elect a template

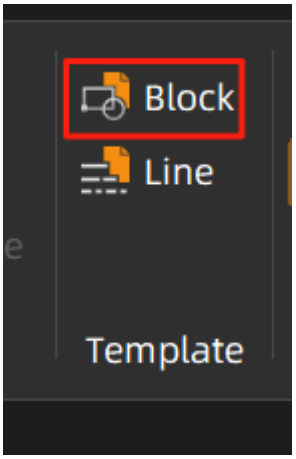


Figure: Block Template

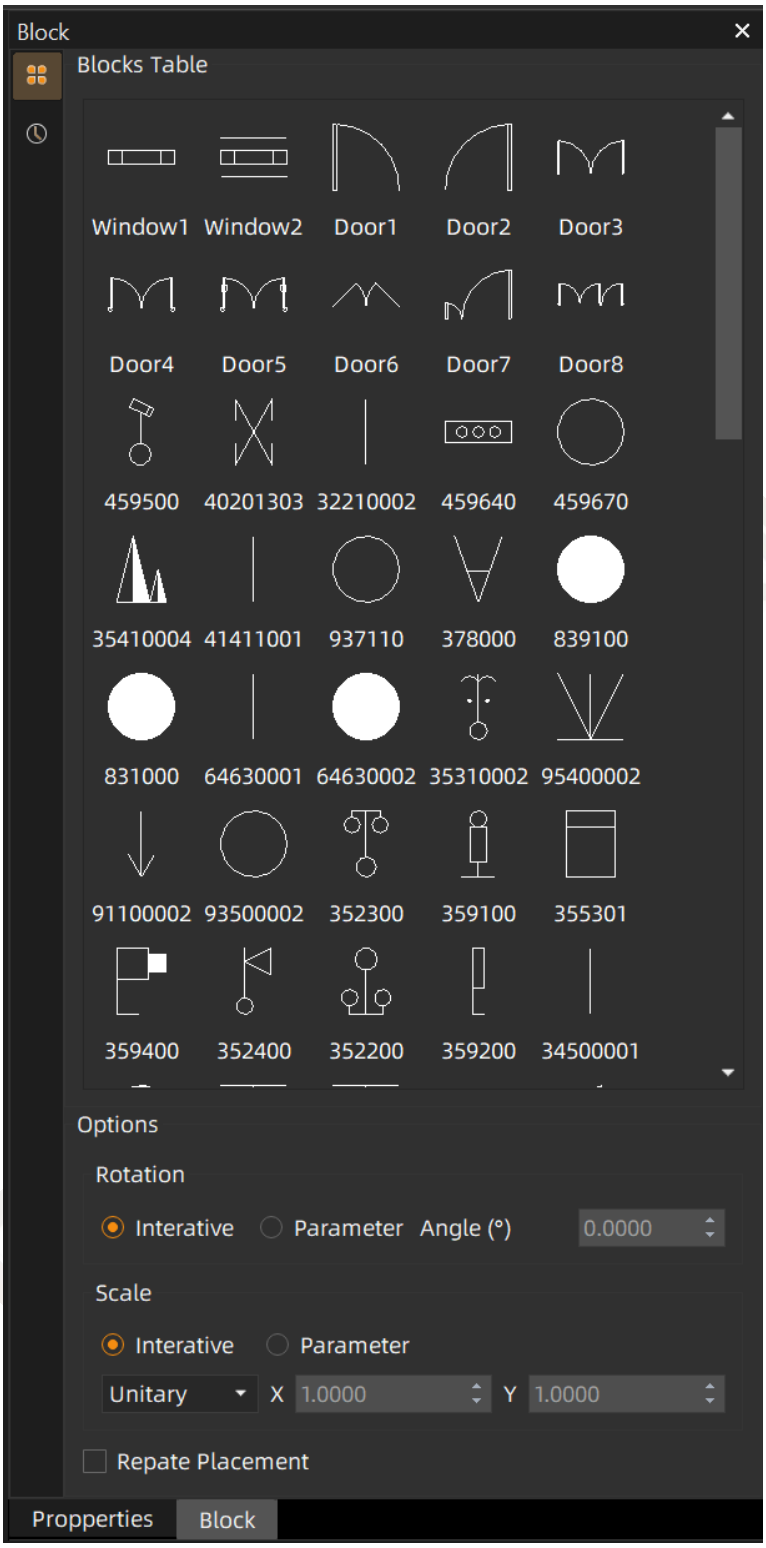


Figure: Block Table Panel

 Select the drawing mode in the block table panel. By default, rotation and scale ar e set to "Interactive" mode, and the scale ratio is set to "Unitary".

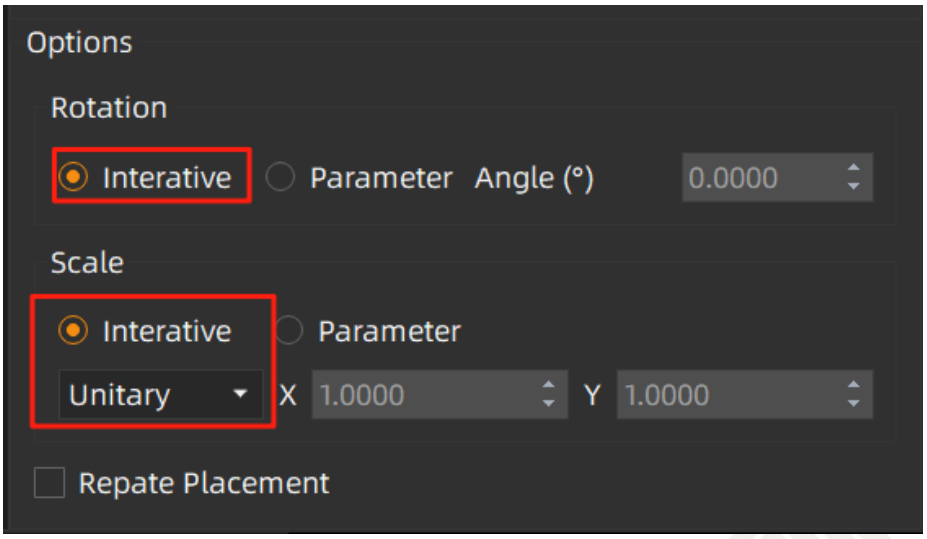


Figure: Default Option Settings

□ Click a point in the view as the insertion point of the block.

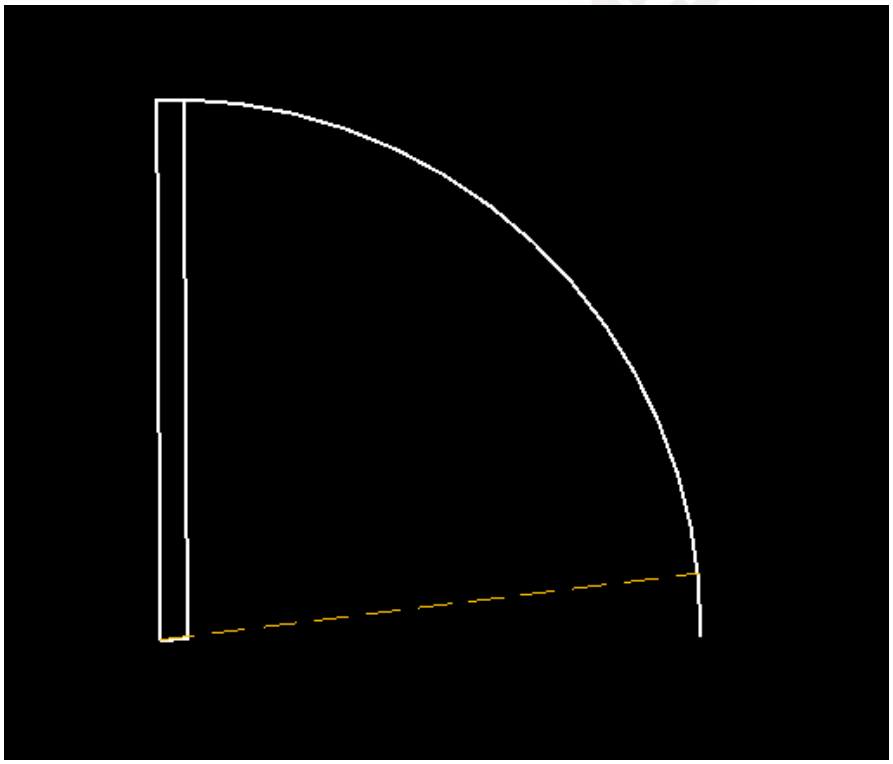


Figure: Insertion Point of the Block

□ Move the mouse to adjust the rotation angle, and click a point to determine the rotation angle of the block. If the "Parameter" mode is selected, the preset angle value will be directly used as the rotation angle of the block without adjustment in the view.

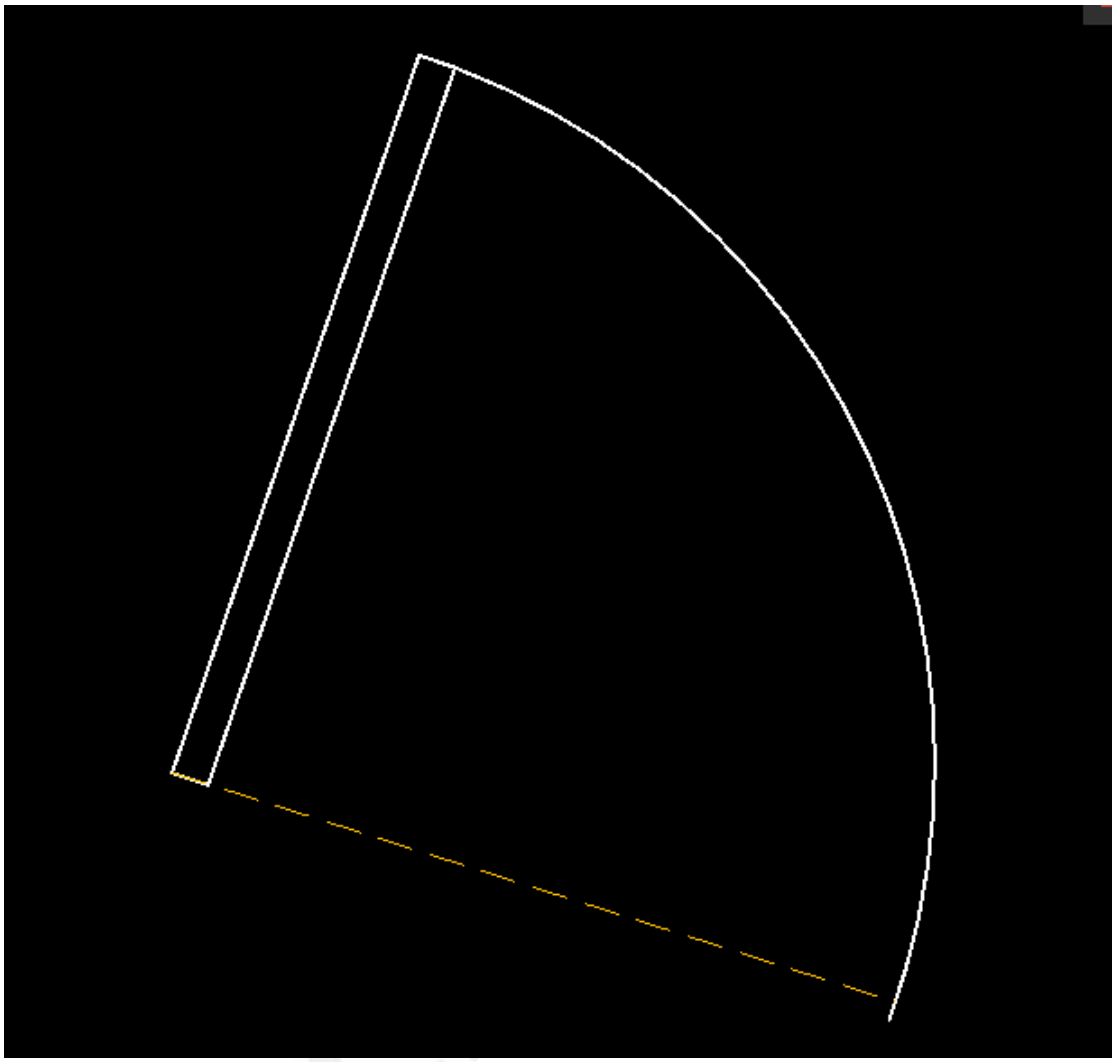


Figure: Adjust Rotation Angle

 Move the mouse to adjust the scaling ratio, and click a point to determine the scaling ratio of the block to complete the block drawing. If the "Parameter" mode is selected, the set X and Y scaling ratios will be directly used as the scaling ratios of the block without adjustment in the view.

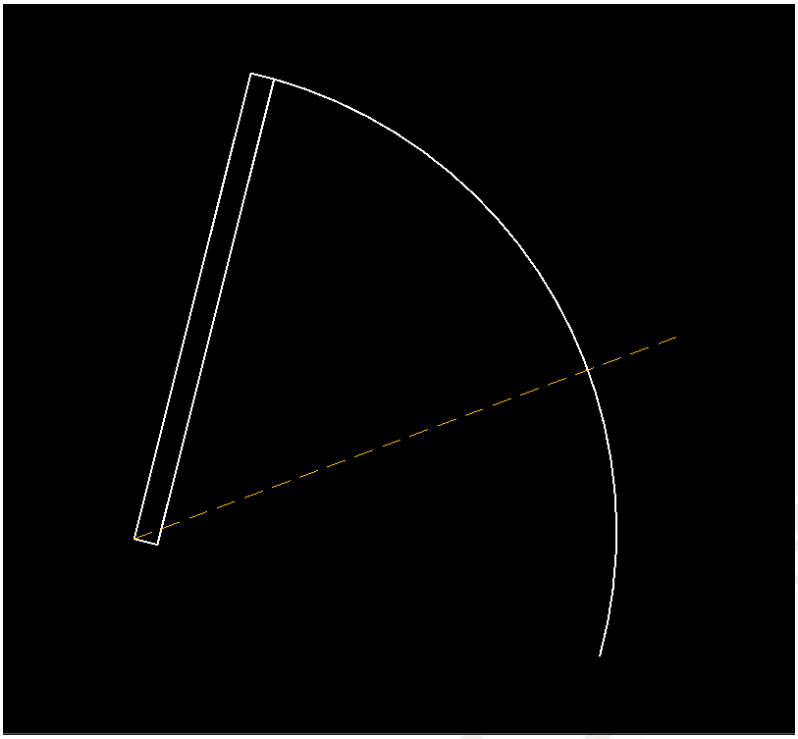


Figure: Adjust Scale

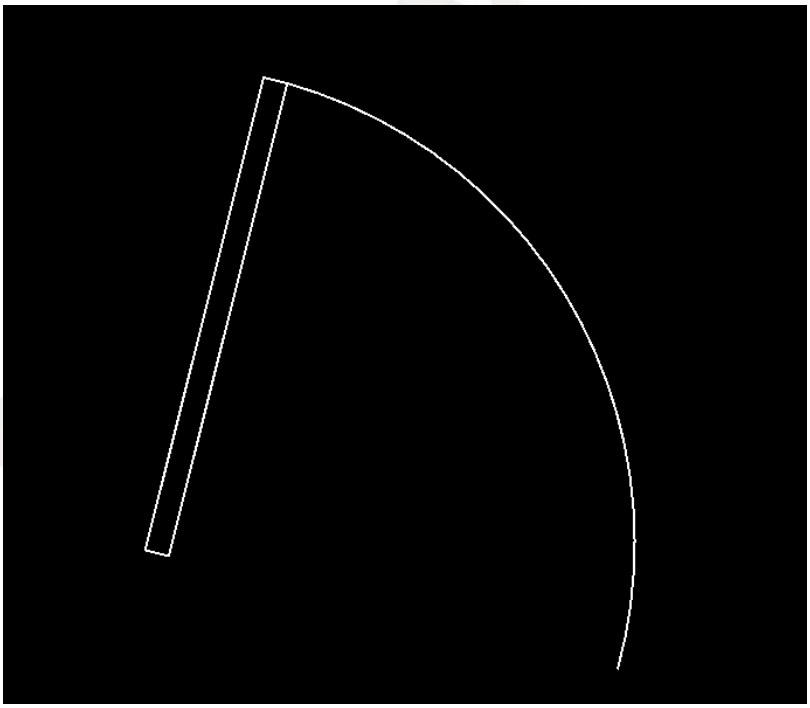


Figure: Completion

Parameter Settings:

Unitary Scale: The scaling ratios in the X and Y directions of the block is always 1:1. When the value of any attribute in X or Y is modified, the other value will cha

nge accordingly, and the positive or negative value only represents the direction of the block.

Respective Scale: When "Respective Scale" is selected, the scaling ratios in the X o r Y direction of the block can be set separately, and there is no synchronous change relationship between X and Y, and the positive or negative value only represents the direction of the block.

When the rotation angle is 0°, the relationship between the direction of the block and the positive/negative values of the X and Y scaling ratios is as shown in the followin g figure:

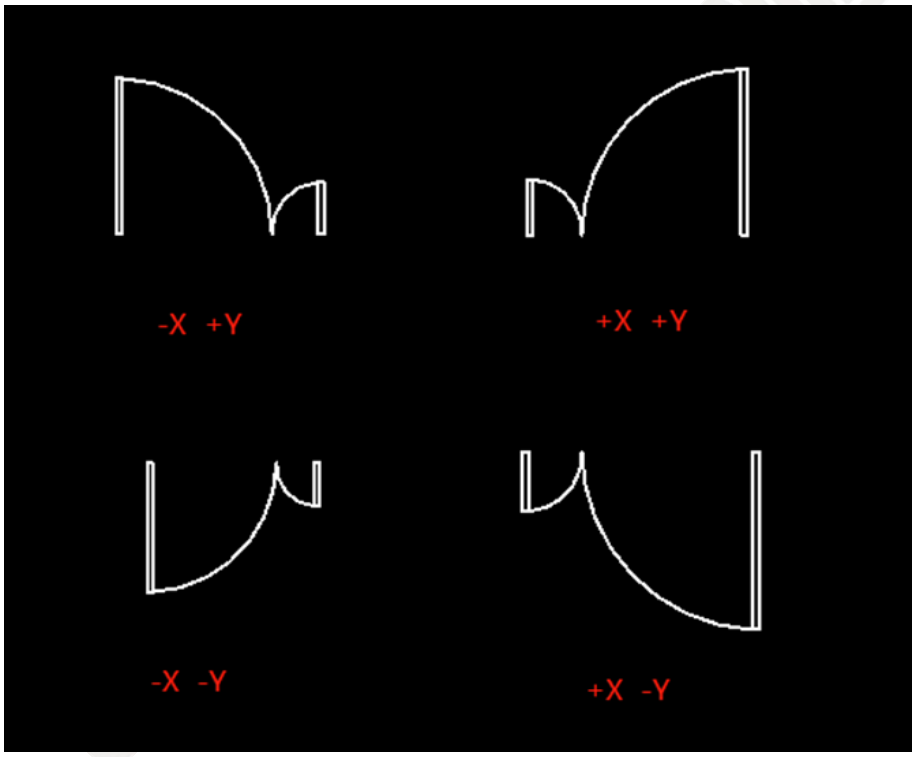


Figure: Direction of the Block

Repeat Placement: By default, "Repeat Placement" is not checked, and the drawing ex its after drawing one block; if "Repeat Placement" is checked, after drawing one bloc k, the rotation angle and scaling ratio of the block are retained, and you can continue to select only the insertion point in the view to repeatedly draw the same block.

Note:

When drawing a block, you need to set the options in the block table panel first, and then draw the block in the view. After the mouse moves to the vie w, the setting options in the block table panel will be grayed out. To modify the setting options, you need to reselect the block template and set it again.

2.4.8.2 Line

Function Description:

Select the desired line style to draw polylines.

Operation Steps:

 Click Vector -> Template -> Line, and select the line style to be drawn in the line template drawing panel.

Figure: Line Template

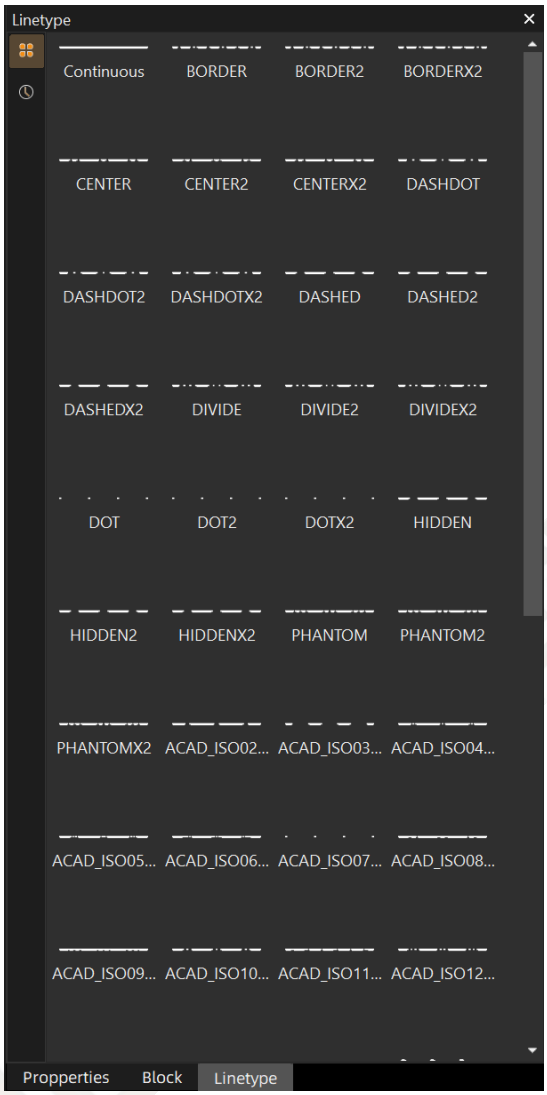


Figure: Line Type Panel

② Draw in the view window. The drawing method is the same as that of polylines, and the line style is the style of the selected line template. If 3D drawing is used, th e selected line style cannot be displayed.

Figure: Drawing Effect of Line Style

2.4.9 Display

2.4.9.1 Vector to Top

Function Description:

Display the vectors in the view on top of all data without affecting the actual position of the vectors.

Operation Steps:

Click Vector -> Display -> Vector Top to switch the On/Off status of vector to top, which is enabled by default.

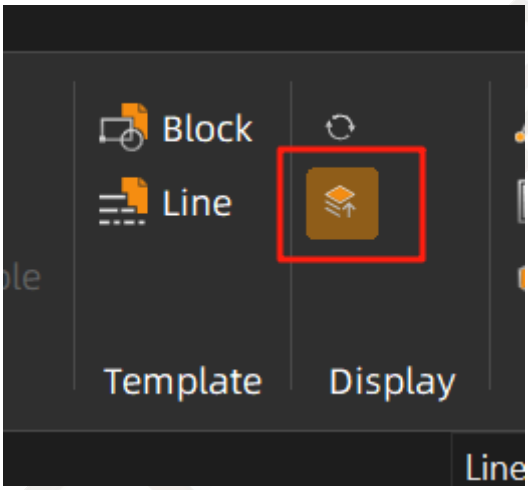


Figure: Vector to Top

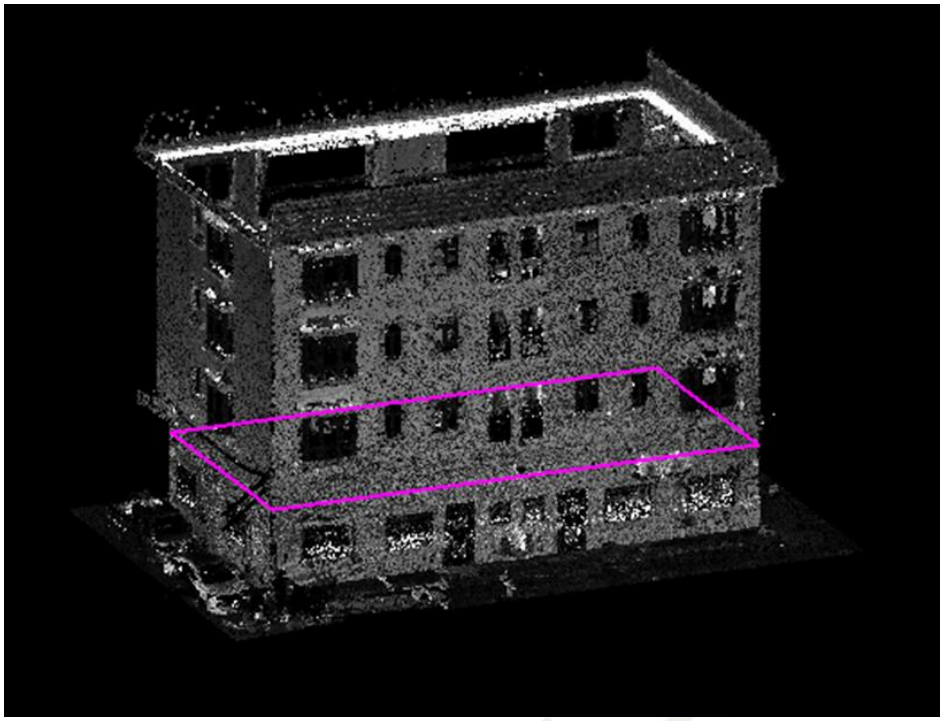


Figure: Effect of Vector to Top

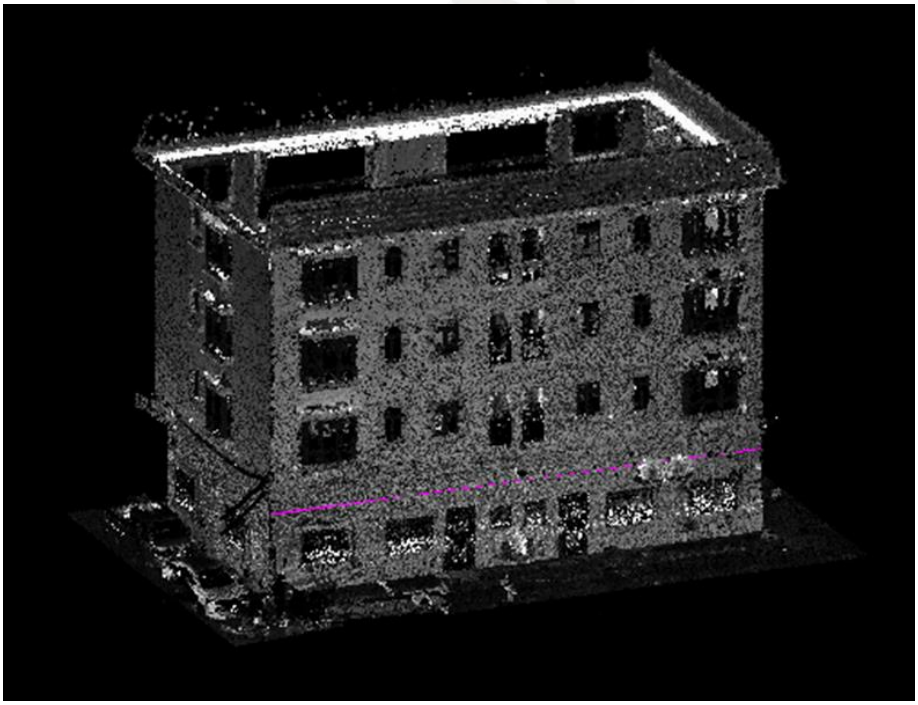


Figure: Effect of Vector Not to Top

2.4.10 Building Extraction

2.4.10.1 Plane Extraction

2.4.10.1.1 Track

Function Description:

Click on the point cloud to automatically track the direction of one edge of the plane contour, and you can switch to manual drawing mode in the right-click menu.

Operation Steps:

① First perform point cloud slicing, click Base -> Slicing -> Horizontal.

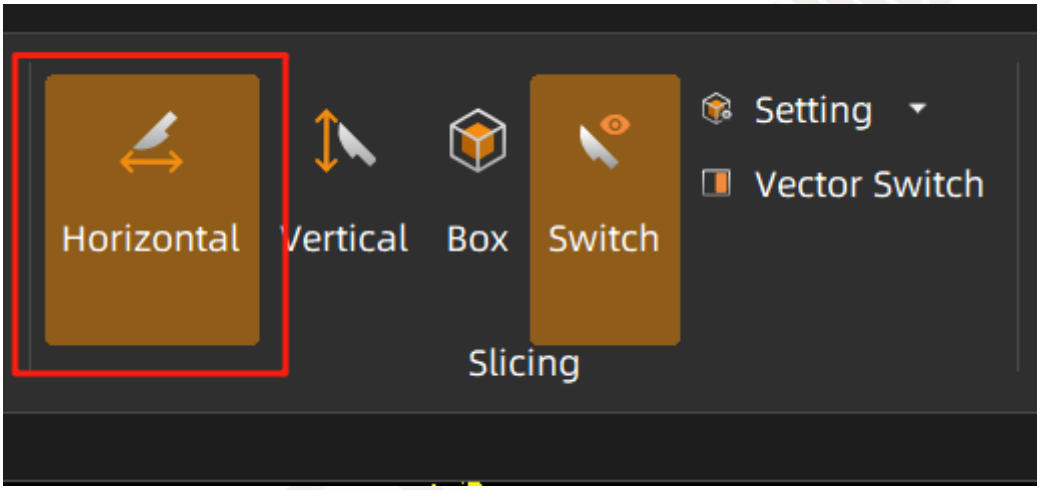


Figure: Horizontal Slice

② In the view, click a point on the point cloud to adjust the slice to an appropriate thickness and position to display a clear and complete building contour point cloud.

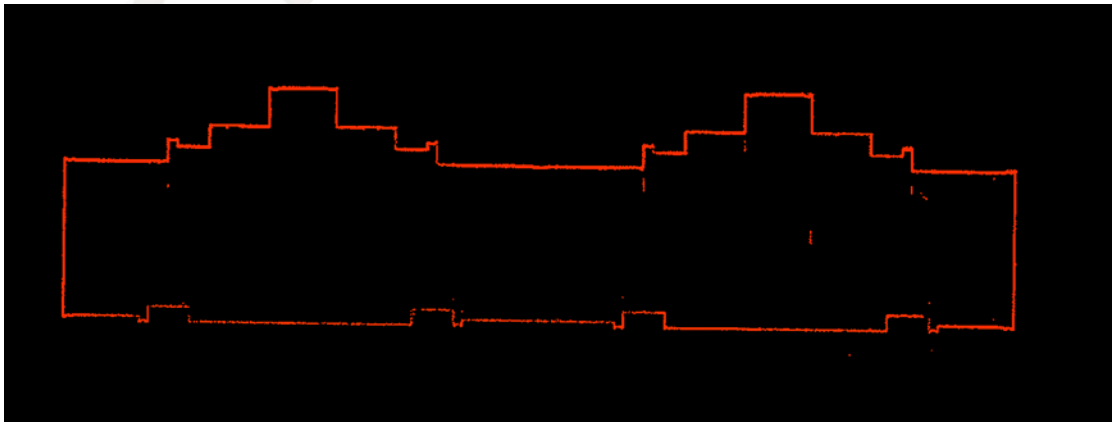


Figure: Building Contour Point Cloud

③ Click Vector -> Extraction -> Planar Extraction -> Track.

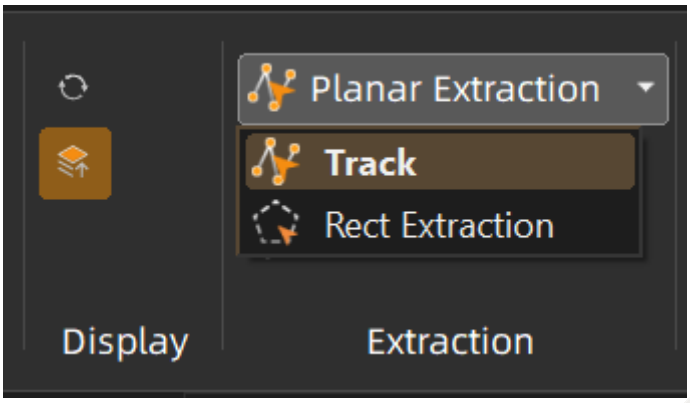


Figure: Track

④ In the view, click two points to determine the direction of the first edge of the plane contour.

⑤ In the view, click a point to determine the direction of the next edge, which intersects with the previous edge, and continue drawing as needed.

⑥ In the view, press Enter to end, or right-click and select "Ok" to complete the plane contour drawing. The default drawn vector is closed. If you need to draw a non-closed vector, uncheck "Auto-Close" in the right-click menu.

⑦ During the drawing process, right-click and select "Undo" or use the shortcut key U to undo one point.

⑧ The default is "2D Drawing". In track mode, the vector elevation is always constrained to the same plane during both "2D Drawing" and "3D Drawing".

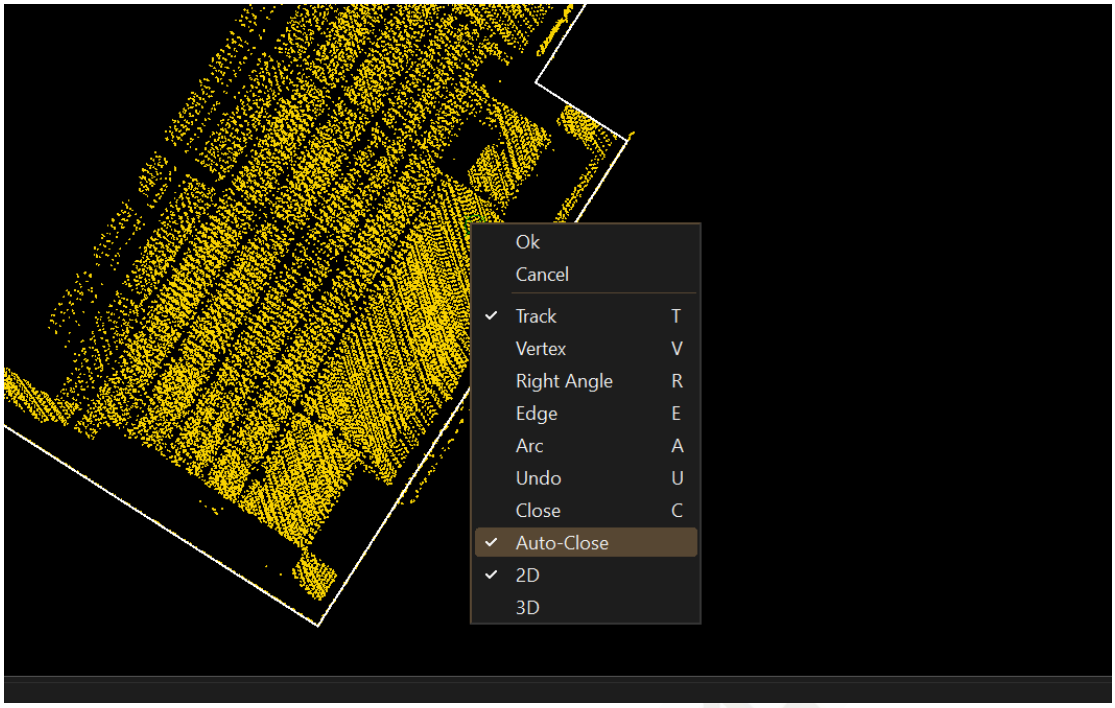


Figure: Right-Click in Track Mode

2.4.10.1.2 Rect Extraction

Function Description:

Draw a polygon to select point clouds and automatically extract building plane contours.

Operation Steps:

Load the point cloud and perform point cloud slicing, click Base -> Slicing -> Horizontal.

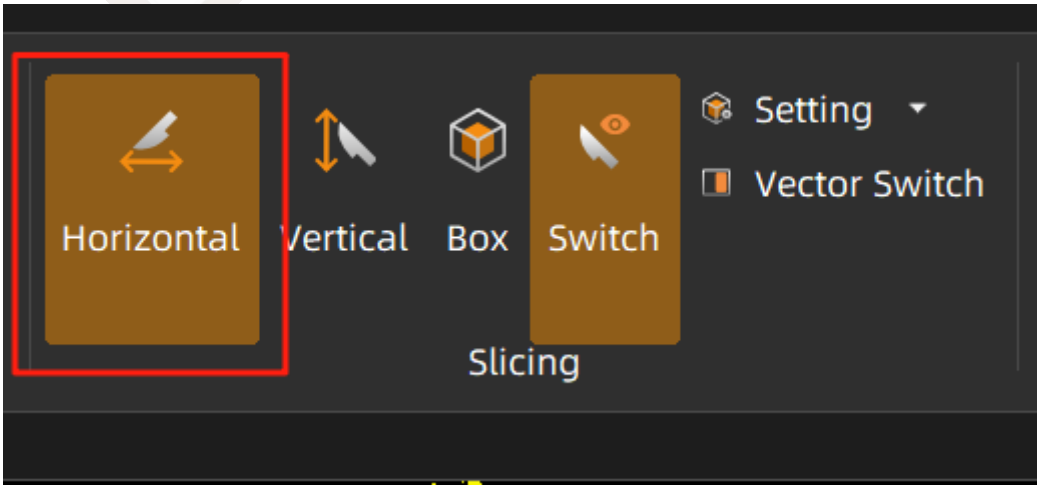


Figure: Horizontal Slice

In the view, click a point on the point cloud to adjust the slice to an appropriate thic kness and position to display a clear and complete building contour point cloud.

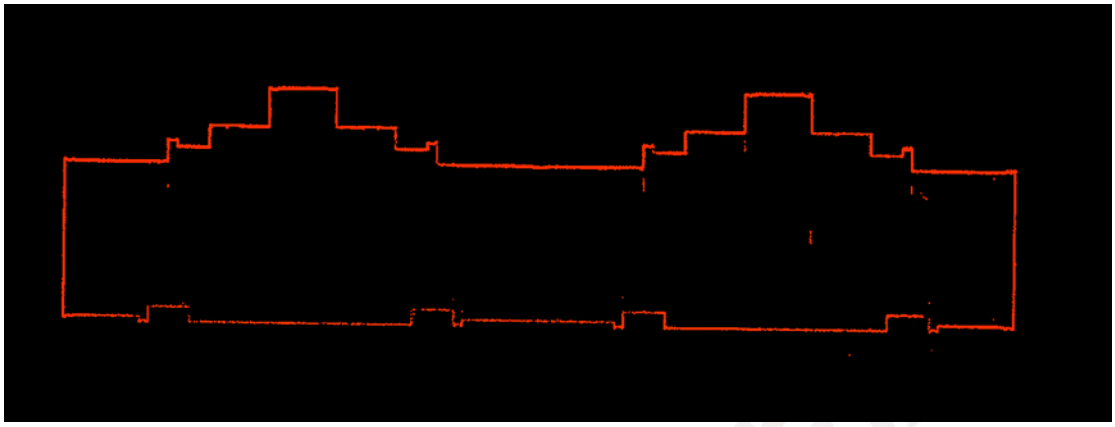


Figure: Building Contour Point Cloud

Click Vector -> Building Extraction -> Planar Extraction -> Rect Extraction.

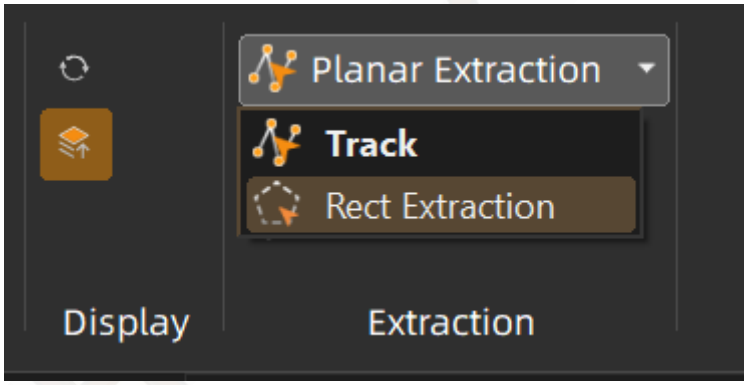


Figure: Frame Selection

In the view, click to draw a polygon to frame the building contour point cloud, and t he software will automatically identify and extract the building plane contour line.

During the drawing process, right-click and select "Undo" or use the shortcut key U t o undo one point.

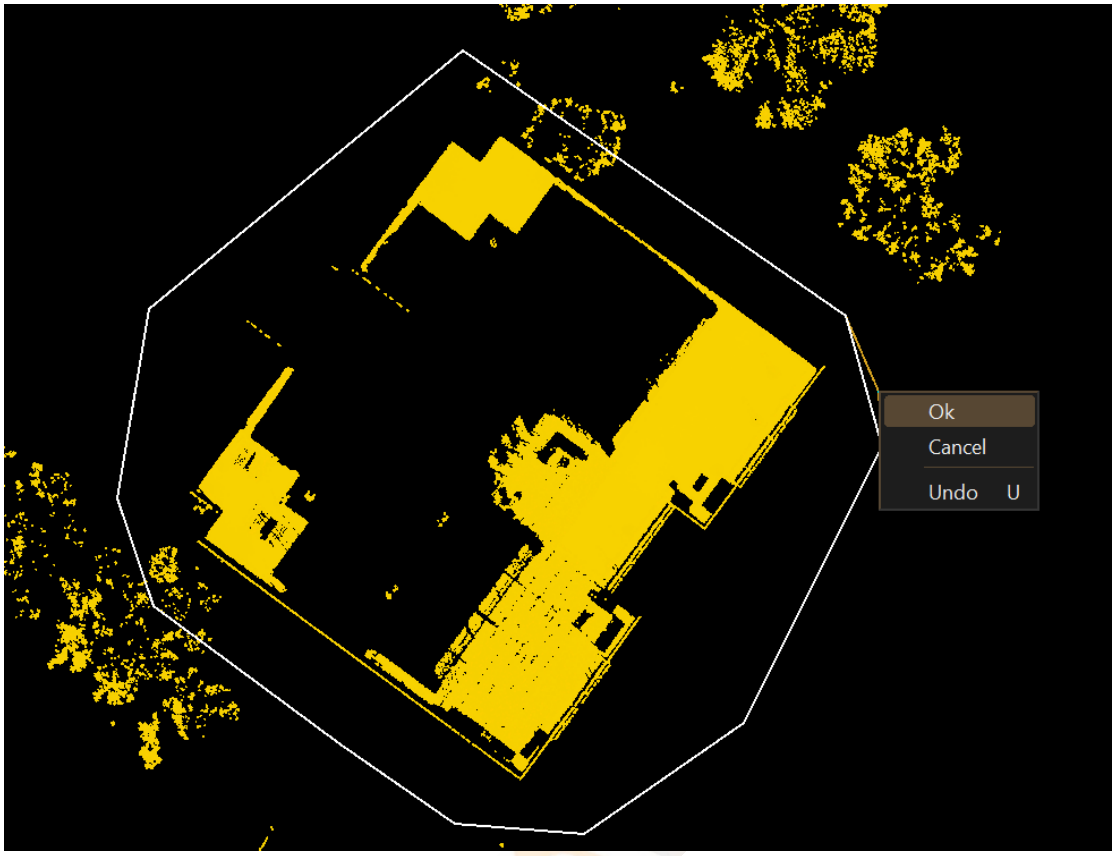


Figure: Right-Click in Rect Extraction

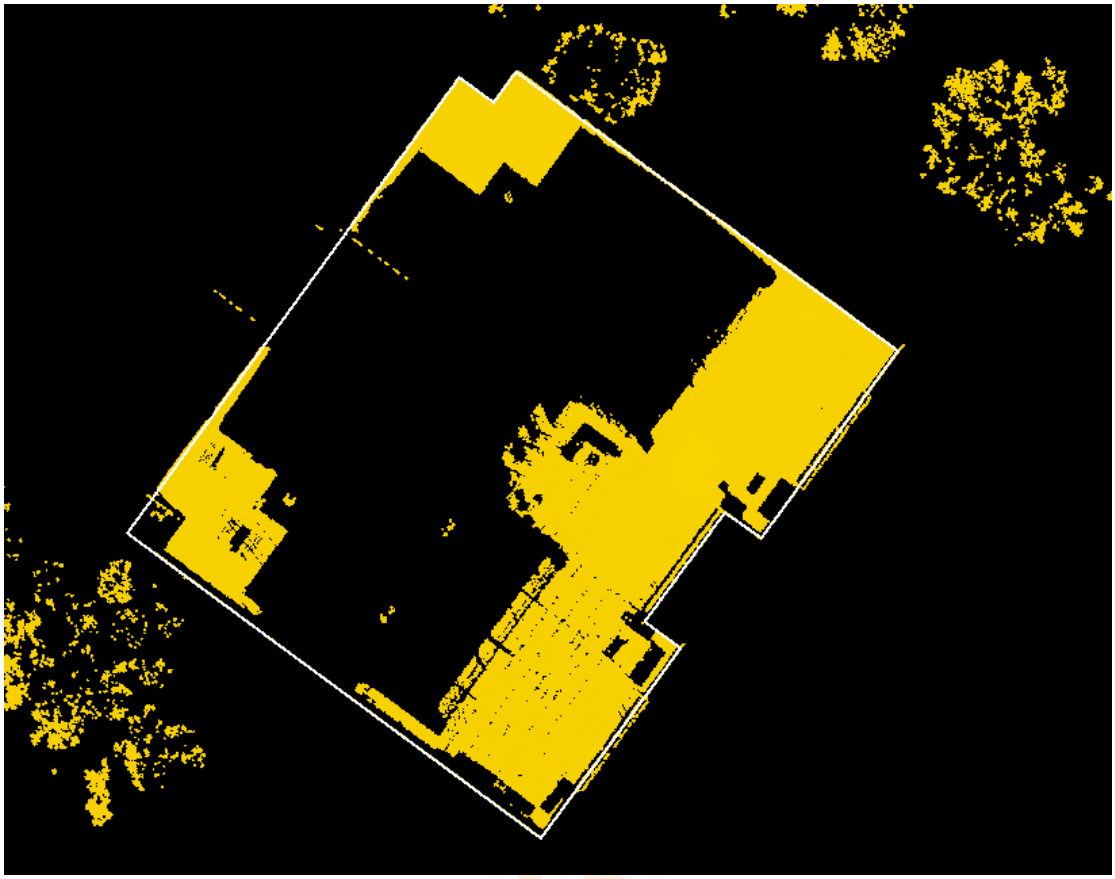


Figure: Result of Rect Extraction

2.4.10.2 Create Facade

2.4.10.2.1 Select

Function Description:

Select vector lines or facade proxy lines to create facade views.

2.4.10.2.1.1 Create Facade - Four-View

Operation Steps:

 Click Vector -> Extraction -> Create Facade -> Select.

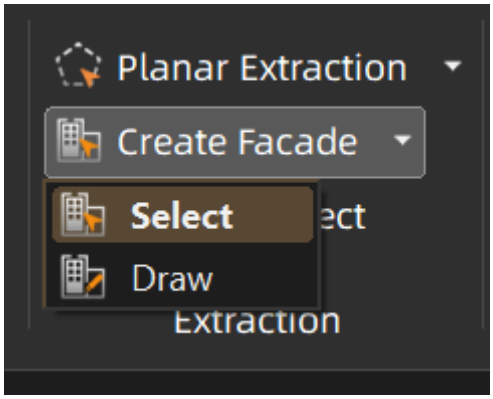


Figure: Selection

□ In the view, click to select a closed vector, and the create facade dialog box will pop up.

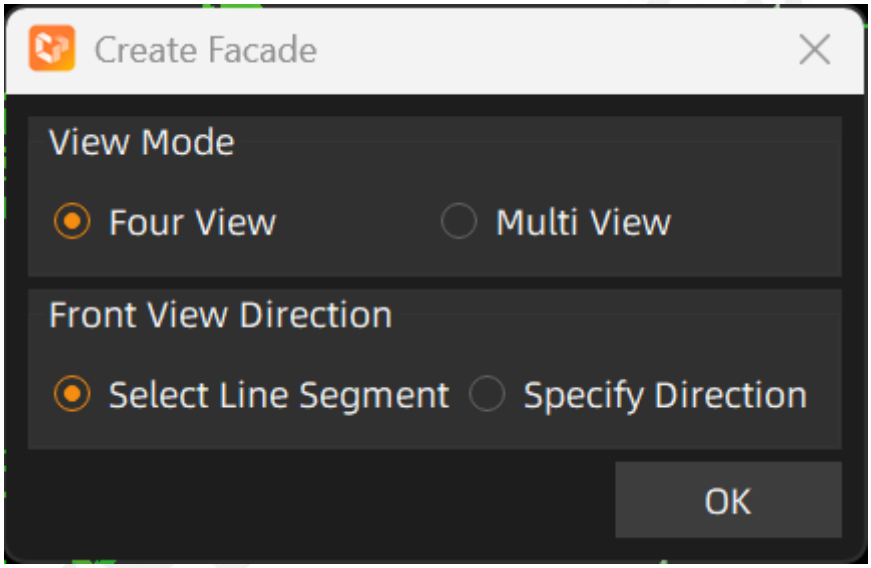


Figure: Create Facade Dialog Box

□ Select "Four-View" for "View Mode".

□ Select "Select Line Segment" or "Specify Direction" to confirm the front view, then click "Ok".

(1) If "Select Line Segment" is selected, after confirmation, you need to select an edge on the selected closed vector as the front view direction to generate facade proxy lines and activate the facade view. The facade view displays the facade point cloud and vector data from the current perspective. Click the first button in the horizontal tool

bar, and click "Front, Left, Back, Right" in the drop-down box to switch and display the facade view point clouds from different directions.

Figure: Four-View Facade Proxy Line

(2)If "Specify Direction" is selected, after confirmation, you need to draw two points i n the view to determine a line segment, confirm the front view direction according to the arrow direction to generate facade proxy lines and activate the facade view. The facade view displays the front view point cloud. Click the first button in the horizont al toolbar, and click "Front, Left, Back, Right" in the drop-down box to switch and d isplay the facade view point clouds from different directions.

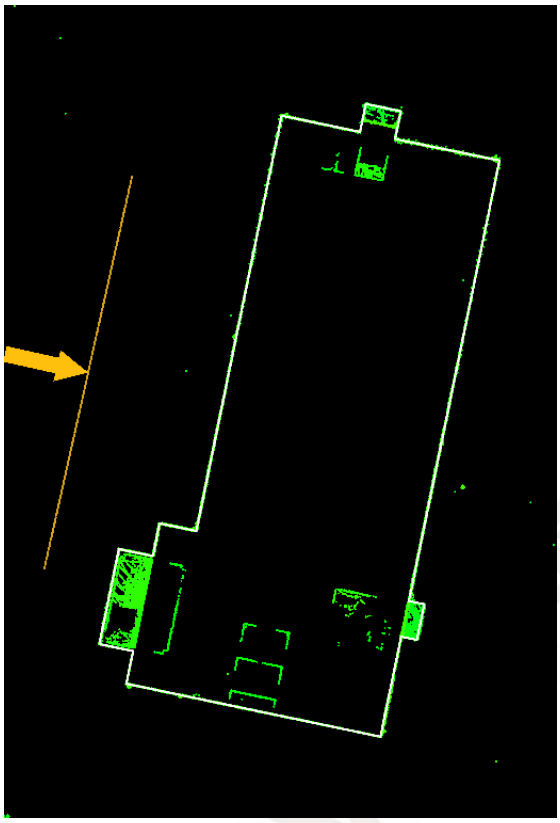


Figure: Specify Direction

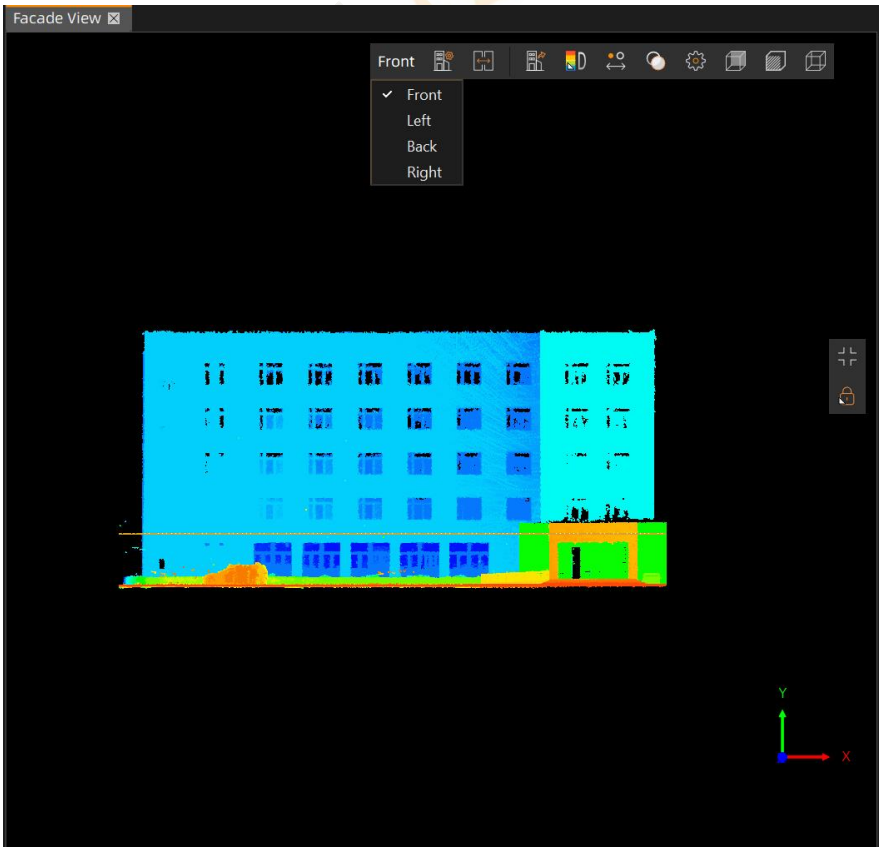


Figure: Facade View - Four-View

2.4.10.2.1.2 Create Facade - Multi-View

Operation Steps:

① Click Vector -> Extraction -> Create Facade -> Select.

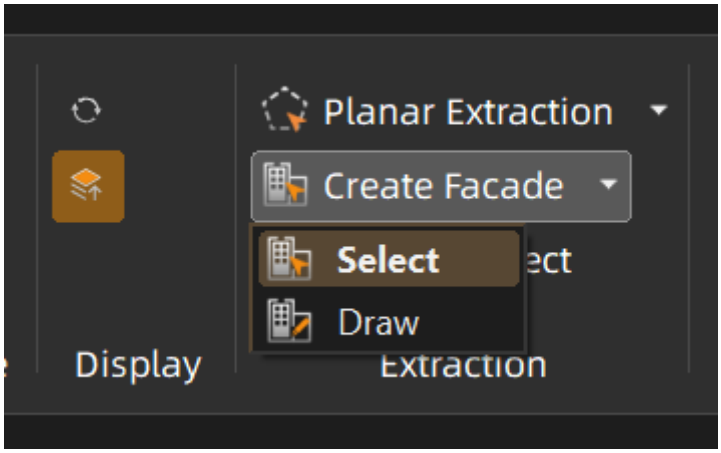


Figure: Select

② In the view, click to select a closed vector, and the create facade dialog box will pop up. If a non-closed vector is selected, this dialog box will be skipped and the facade view will be created directly.

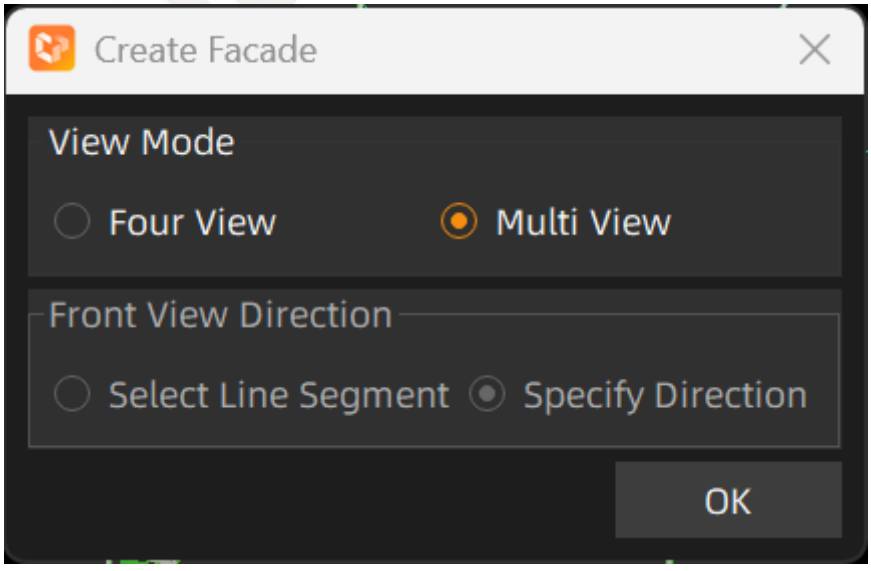


Figure: Create Facade Dialog Box

③ Select "Multi View" for "View Mode" and click "OK" to generate facade proxy lines and activate the facade view. The facade view displays the facade view point cloud of the first segment of the vector. Click the first button in the horizontal toolbar, and click different numbers in the drop-down box to switch and display the facade view point clouds of different edges.

Figure: Multi-View Facade Proxy Line

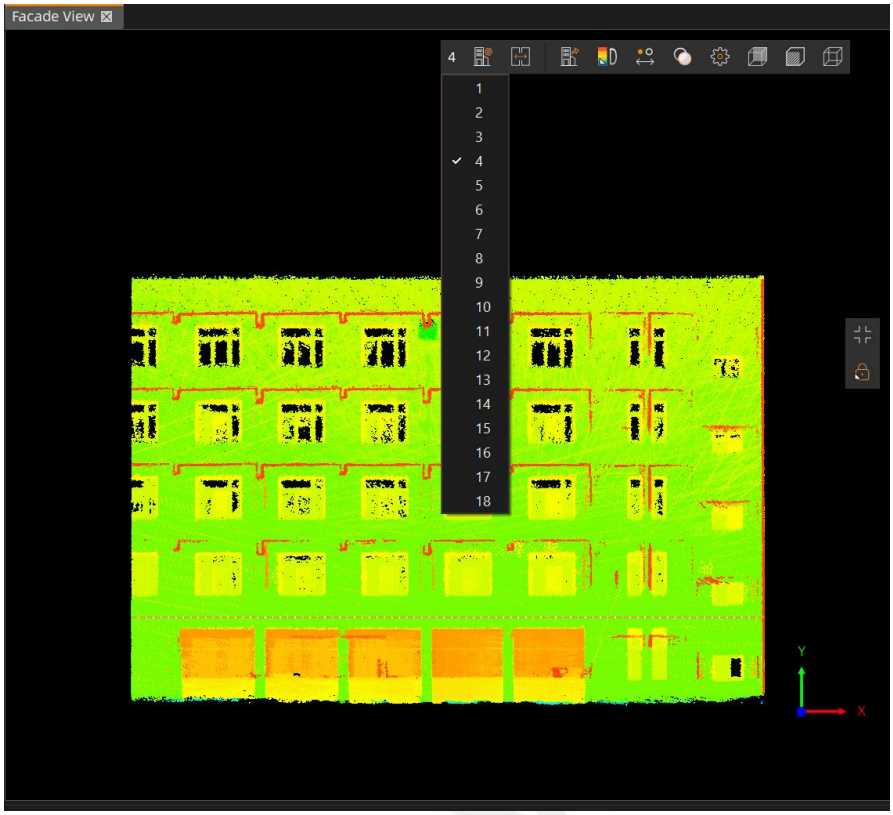


Figure: Facade View - Multi-View

Note:

① If an facade proxy line is selected, it will directly enter the facade view corresponding to the selected facade proxy line.

② The data display range of the current facade view is the range covered by the corresponding facade proxy line in the 3D view from the top view.

③ To recreate the facade, you can delete the original facade proxy line and then select the original vector again to create the facade view.

2.4.10.2.2 Draw

Function Description:

Draw vector lines to create facade views.

Operation Steps:

① Click Vector -> Extraction -> Create Facade -> Drawing.

2.4.10.2.2.1 Create Facade - Four-View

Operation Steps:

① Click Vector -> Extraction -> Create Facade -> Draw.

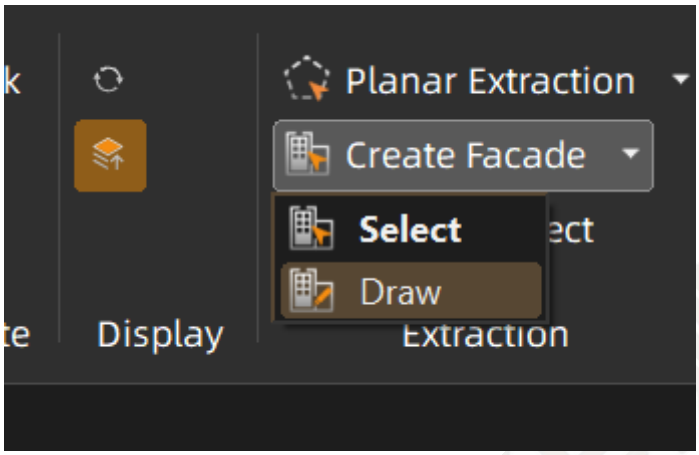


Figure: Draw

 In the view, click to draw a polyline, which is in vertex mode by default. You can right-click to switch to other drawing modes. After checking "Auto-Close" or right-clicking "Close", end the drawing, and the vector line is closed, and the create facade dialog box will pop up.

Figure: Right-Click in Drawing

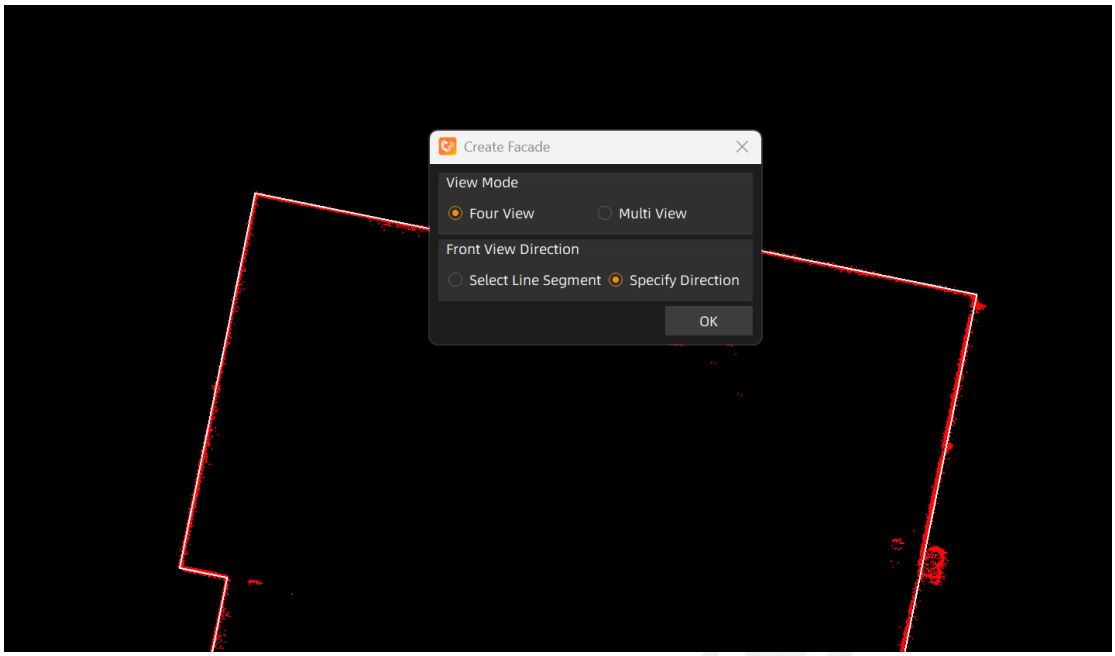


Figure: Create Facade Dialog Box

□ Select "Four-View" for "View Mode".

□ Select "Select Line Segment" or "Specify Direction" to confirm the front view.

(1) If "Select Line Segment" is selected, after confirmation, you need to select an edge on the drawn closed vector as the front view direction to generate facade proxy lines and activate the facade view. The facade view displays the front view point cloud. Click the first button in the horizontal toolbar, and click "Front, Left, Back, Right" in the drop-down box to switch and display the facade view point clouds from different directions.

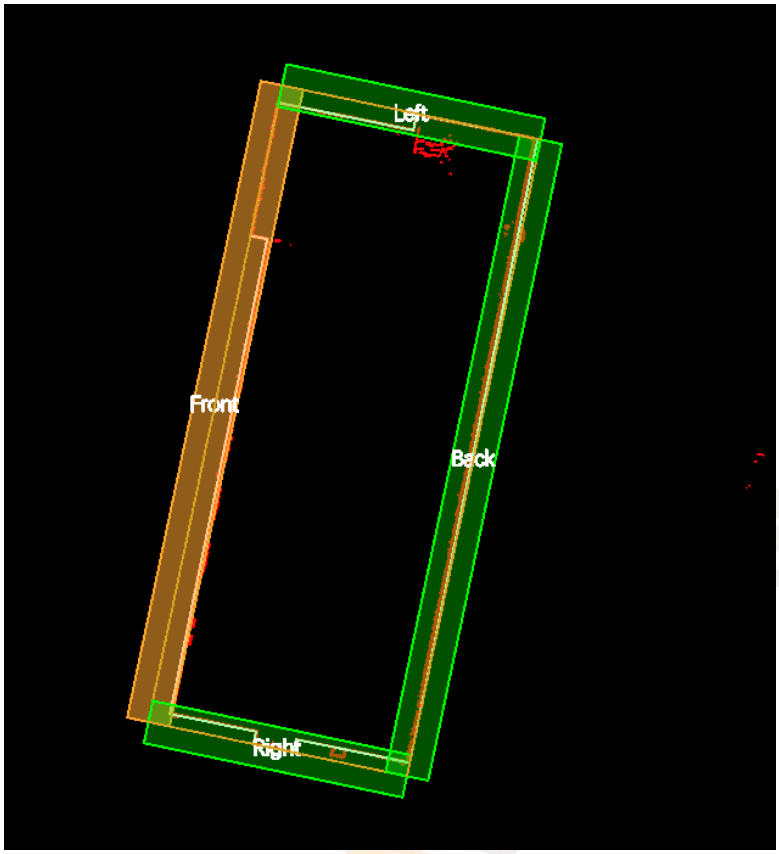


Figure: Four-View facade Proxy Line

(2) If "Specify Direction" is selected, after confirmation, you need to draw two points in the view to determine a line segment, confirm the front view direction according to the arrow direction to generate facade proxy lines and activate the facade view. The facade view displays the front view point cloud. Click the first button in the horizontal toolbar, and click "Front, Left, Back, Right" in the drop-down box to switch and display the facade view point clouds from different directions.

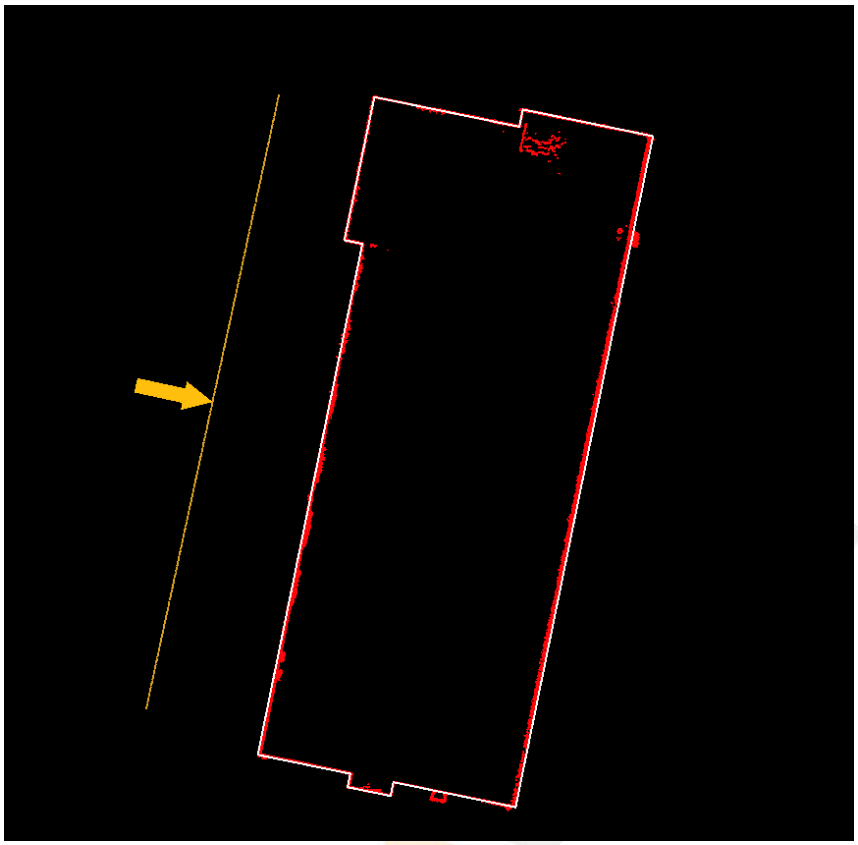


Figure: Specify Direction

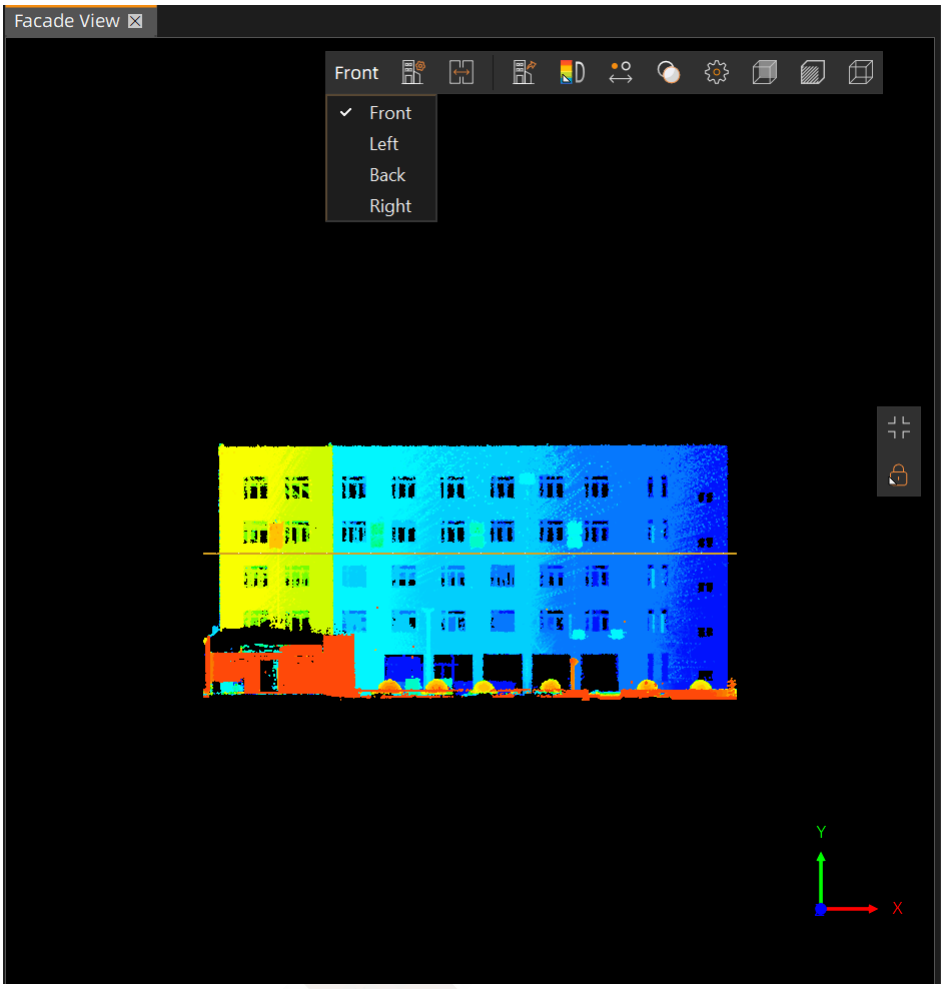


Figure: Facade View - Four-View

2.4.10.2.2.2- Create Facade-Multi-View

Operation Steps:

Click Vector -> Extraction -> Create Facade -> Draw.

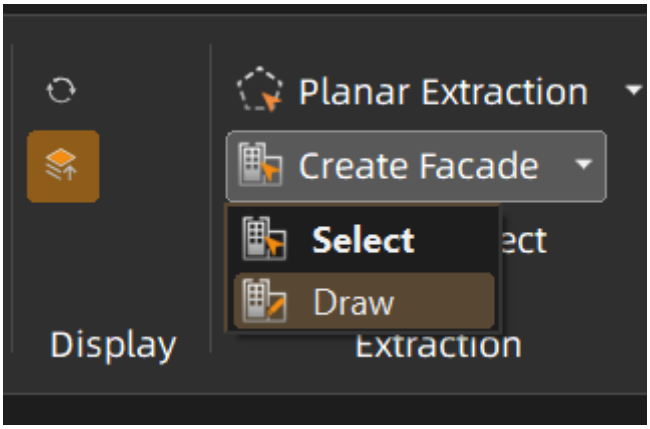


Figure: Draw

 In the view, click to draw a closed vector, and the create facade dialog box will p op up. If a non-closed vector is drawn, this dialog box will be skipped and the facad e view will be created directly.

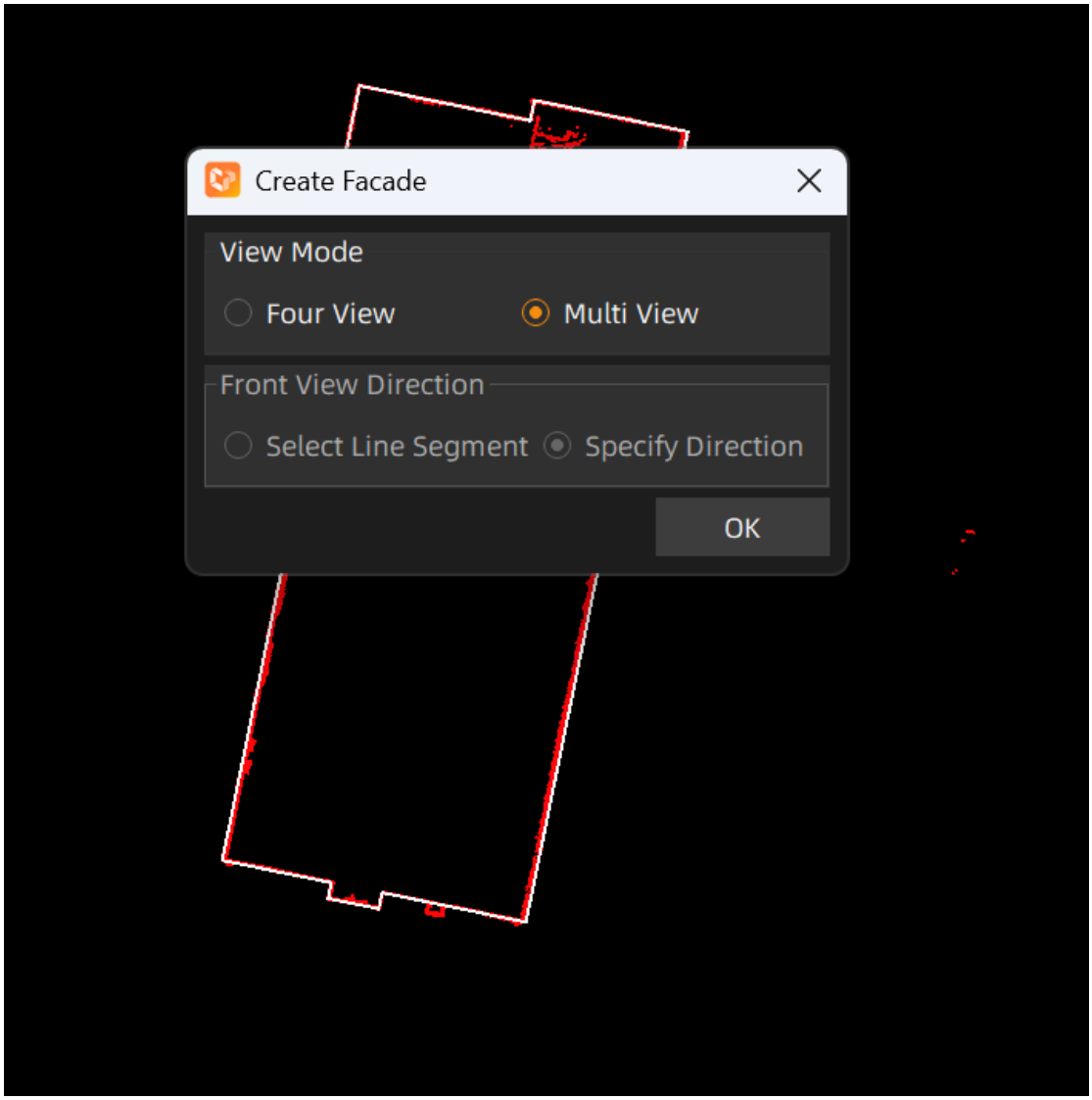


Figure: Create Facade Dialog Box

 Select "Multi-View" for "View Mode" and click "OK" to generate facade proxy lin es and activate the facade view. The facade view displays the facade view point clou d of the first segment of the vector. Click the first button in the horizontal toolbar, a

nd click different numbers in the drop-down box to switch and display the facade vie w point clouds of different edges.

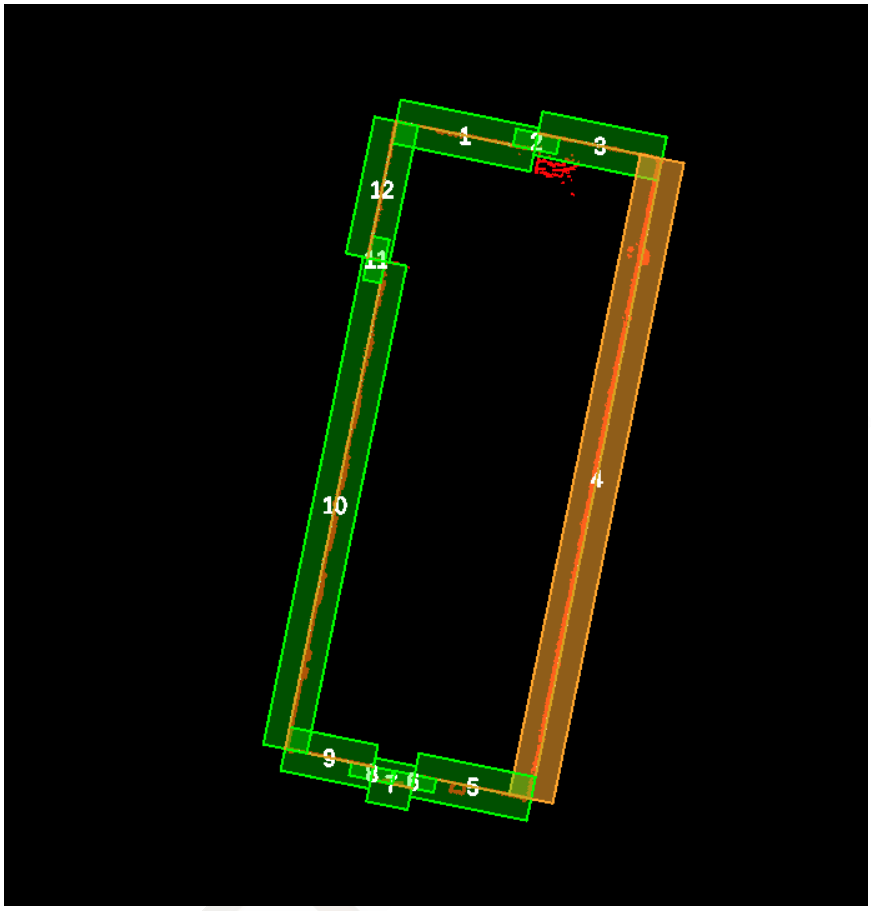


Figure: Multi-View Facade Proxy Line

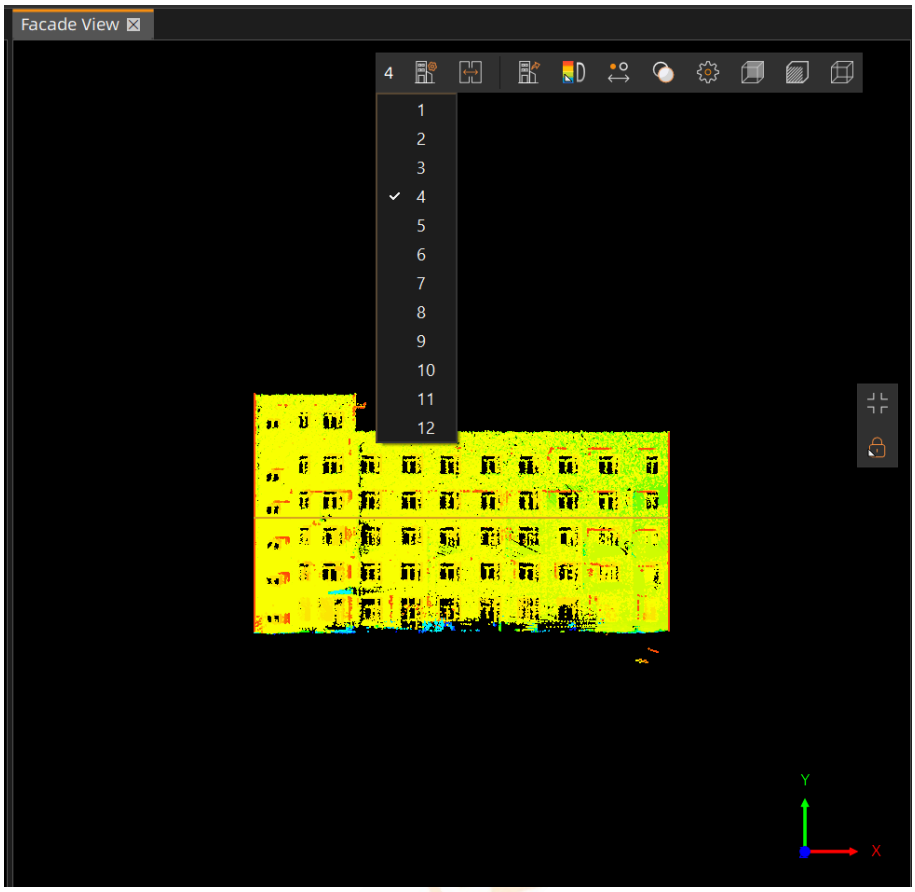


Figure: Facade View - Front View

Note:

① The data display range of the current facade view is the range covered by the corresponding facade proxy line in the 3D view from the top view.

② After closing the create facade dialog box, the drawn vector line will not be retained.

2.4.10.3 Facade Project

Function Description:

By selecting the facade proxy line, flattem and copy all vector elements in the relevant facade to the 3D view.

Operation Steps:

□ Click Vector -> Extraction -> Facade Project.

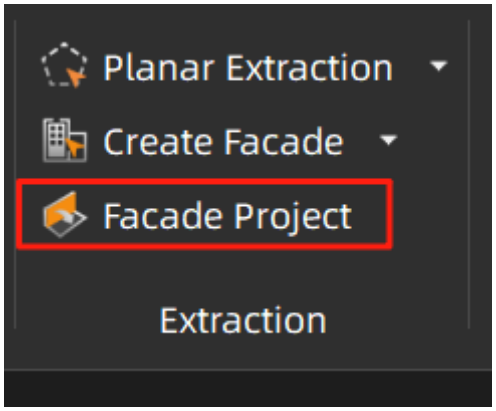


Figure: Facade Project

 Click the facade proxy line in the 3D view, and all vectors in the facade willappe ar at the mouse cursor in preview state.

 Click a point with the mouse to determine the base point position for facade flatte ning and complete the facade flattening operation.

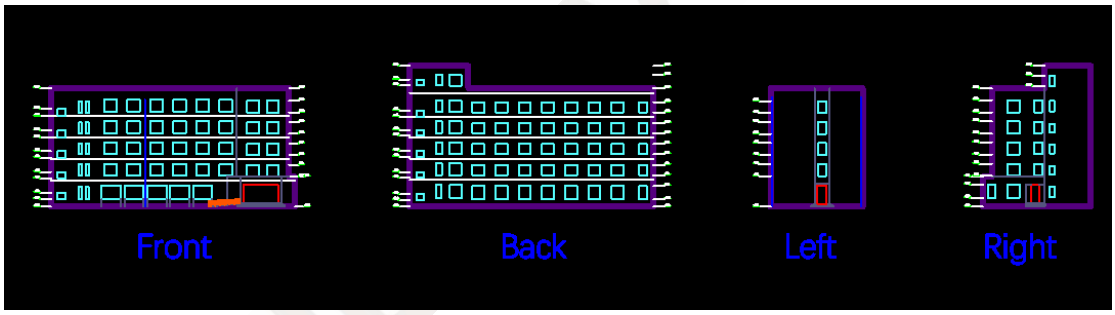


Figure: Effect of Facade Flattening

2.5 Help

2.5.1 Help

 Click Help -> Help, and the help document can be opened after clicking.

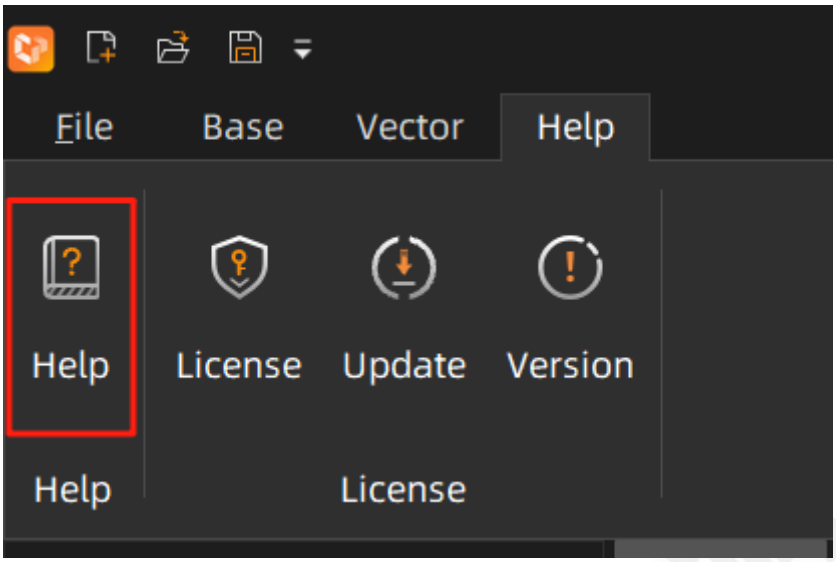


Figure: Help

2.5.2 License

Function Description:

Click to view the software license status or activate it. If the software is not authorized or the authorization has expired, the license manager interface will pop up directly when starting the software. The software supports three registration methods: registration code, Pre-code, and dongle.

Operation Steps:

 Click Help -> License to pop up the license manager dialog box, where you can view the current software license status.

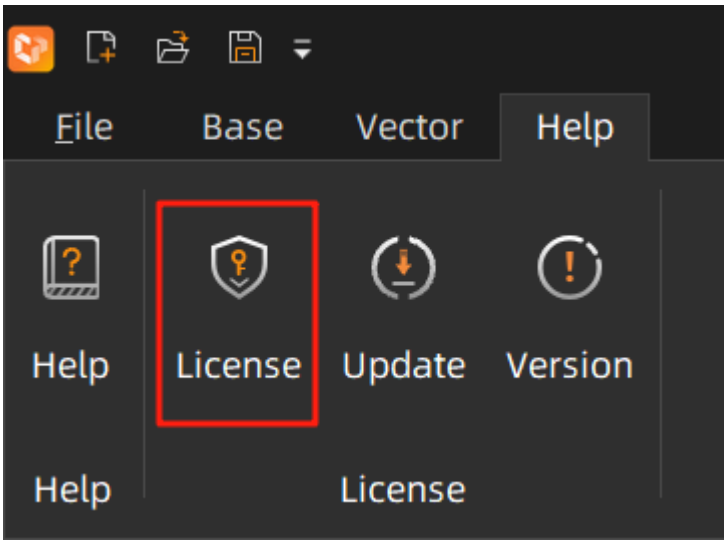


Figure: License

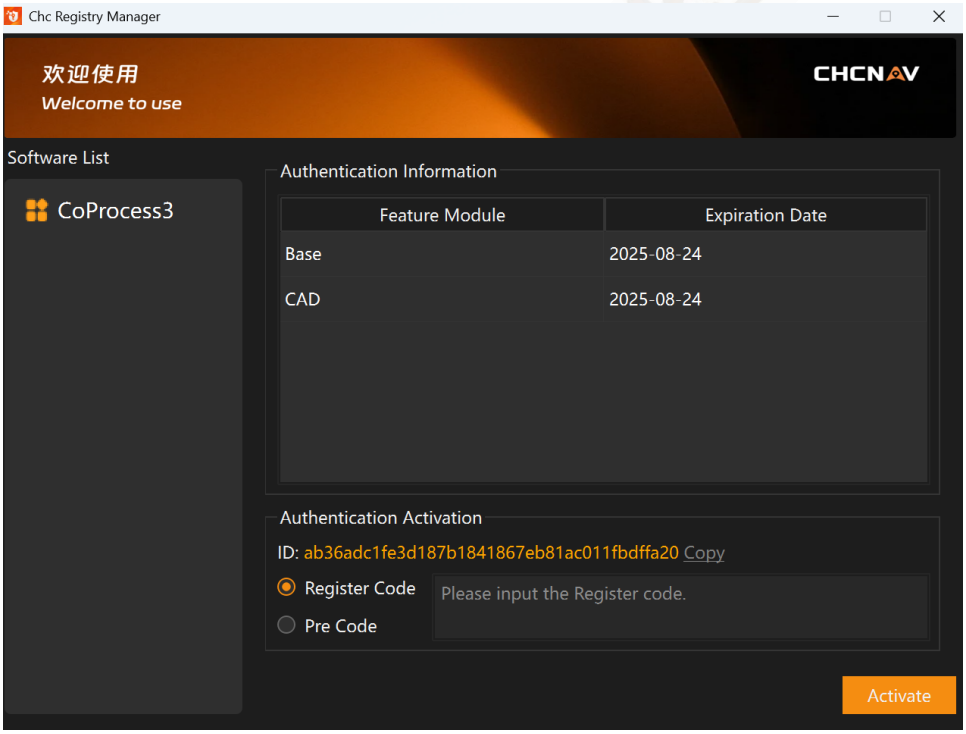


Figure: License Manager Interface

2.5.2.1 Activation via Registration Code

Function Description:

Activate the software by entering the registration code, supporting offline activation.

Operation Steps:

 Click Help -> License to pop up the license manager dialog box, or when there is no permission, start the software and the license manager dialog box will pop up directly.

 On the authorization activation page of the license manager dialog box, copy the "Machine ID" and send it to the software service personnel to obtain the registration code.

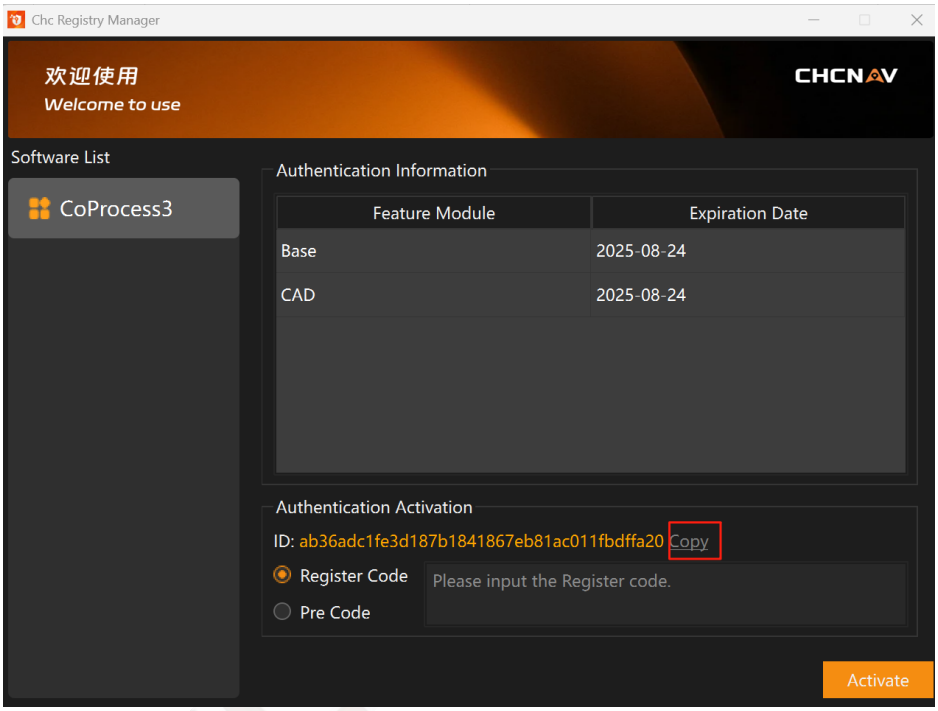


Figure: Copy Machine ID

 Select "Registration Code" and enter the obtained registration code in the input box.

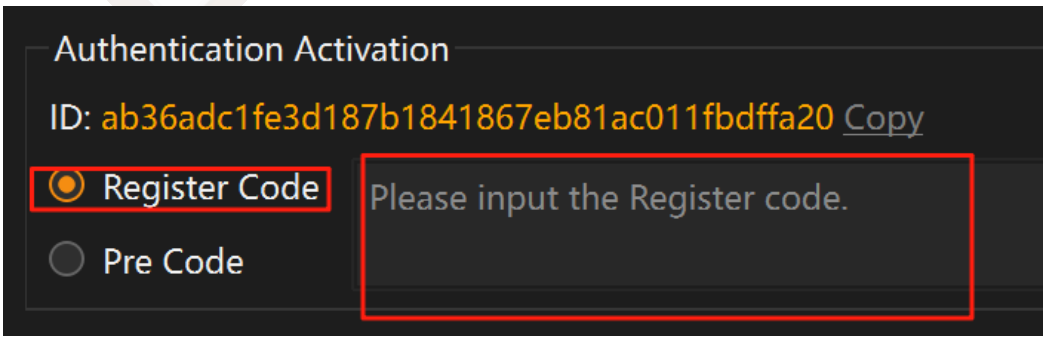


Figure: Enter Registration Code

Click "Activate". After the activation is successful, you can start the software and use the functions of the authorized module normally.

2.5.2.2 Activation via Pre-Code

Function Description:

Activate the software by entering the Pre-code. When the machine is connected to the Internet, the Pre-code can be used directly for activation. When not connected to the Internet, you need to convert the Pre-code to a registration code through other methods, and then activate it through the "Activation via Registration Code" method.

Operation Steps:

□ Click Help -> License to pop up the license manager dialog box, or when there is no permission, start the software and the license manager dialog box will pop up directly.

□ On the authorization activation page of the license manager dialog box, copy the "Copy" to copy machine ID and send it to the software service personnel to obtain the Pre-code.

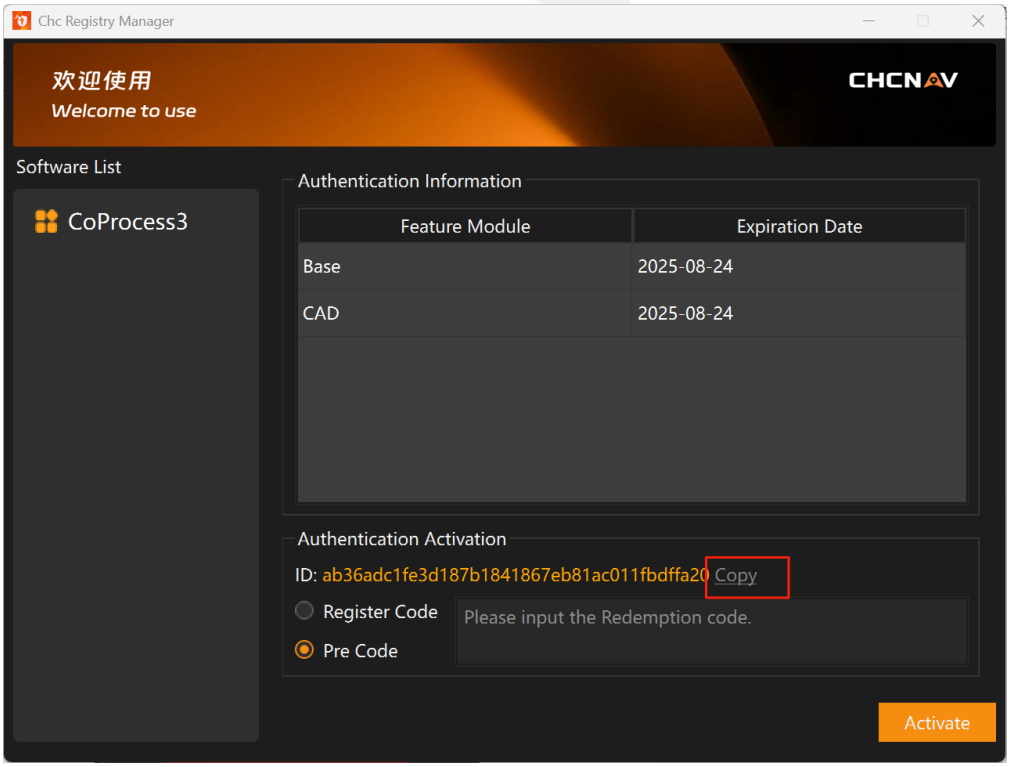


Figure: Copy Machine ID

□ Select "Pre-Code" and enter the obtained Pre-code in the input box.

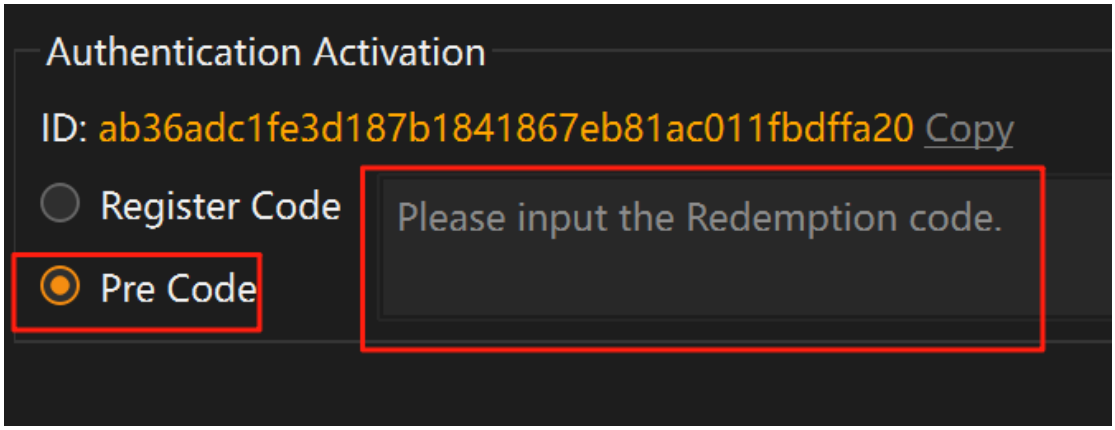


Figure: Enter Redemption Code

□ Click "Activate". After the activation is successful, you can start the software and use the functions of the authorized module normally.

Note:

Internet connection is required when activating by entering the Pre-code.

2.5.2.3 Activate Dongle

Function Description:

After inserting the dongle, activate it by entering Register Code/Pre Code to obtain so ftware authorization.

Operation Steps:

Insert the unauthorized dongle and launch the registry manager, the license dialog will pop up.

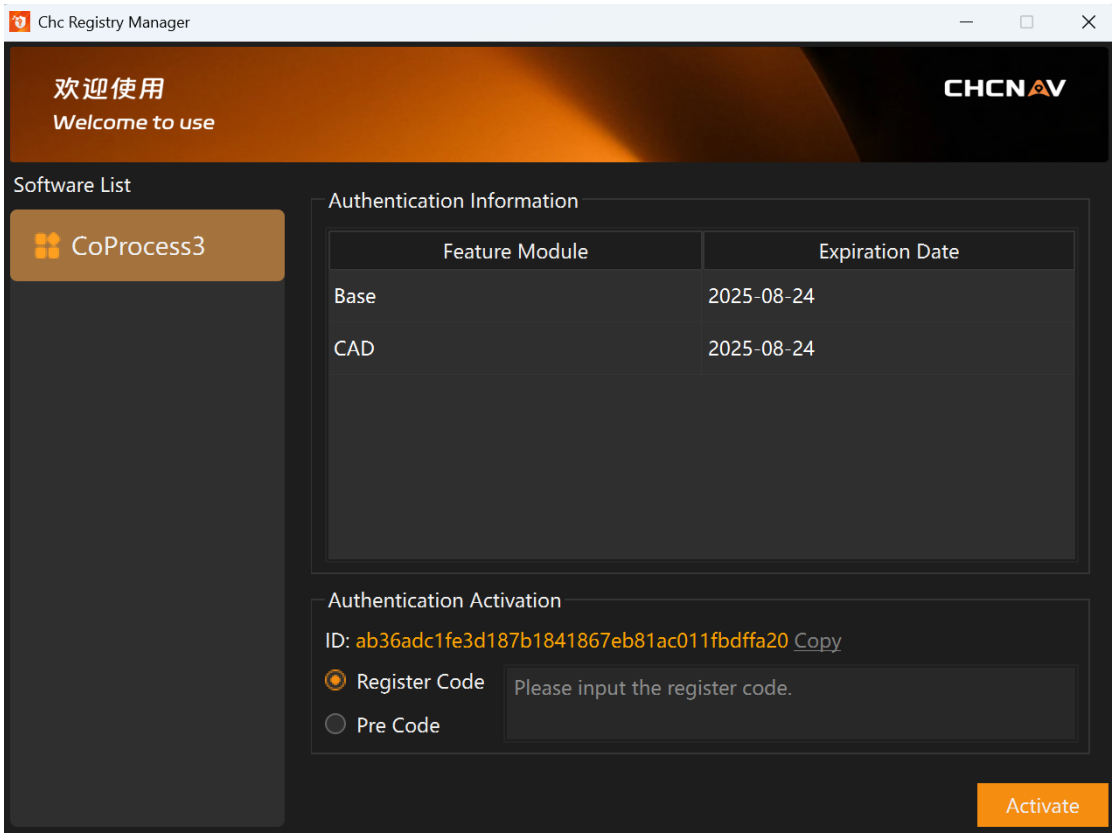


Figure: Registry Manager

Dong can be activated via either registration code or pre-code.

(1) Activation via registration code: On the authorization page of the Register Manage r dialog box, select "Register Code" and enter the obtained registration code in the in put box. Click "Activate"; once the activation success prompt appears, you can launch the software and use the functions of the authorized module normally.

(2) Activation via pre-code: On the authorization page of the Register Manager dialog box, select "Pre-Code" and enter the obtained pre-code in the input box. Click "Activ ate"; once the activation success prompt appears, you can launch the software and use the functions of the authorized module normally.

2.5.3 Update

Function Description:

Click the "Update" button to check for the latest version. If the current software is n

ot the latest version, you can use this function to update the software to the latest ve rsion.

Operation Steps:

If the current version is not the latest, clicking the "Update" button will bring up the update content dialog box. If the current version is already the latest, no dialog box will pop up, and the output window will display the message: "You are using the late st version."

2.5.4 Version

Function Description:

Click "Version" to check the currect version information.

Operation Steps:

 Click Help -> License->Version, pop up Coprocess 2025 version information, copyri ght description and download link of latest version.

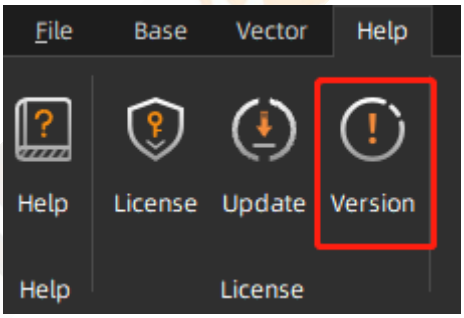


Figure: Version

Figure: Version Information

3.Introduction to Operation Process

3.1 Basic Data Processing

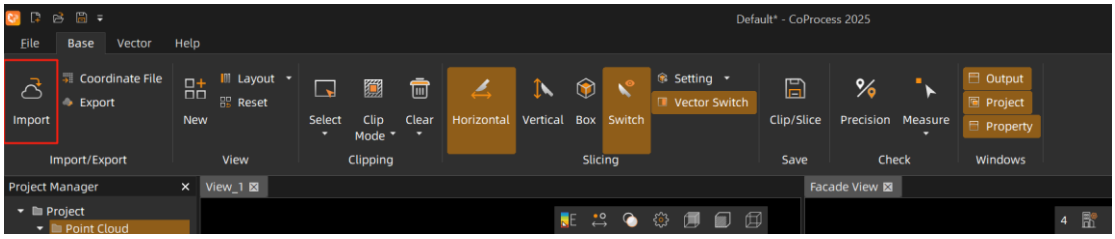
3.1.1 Add Data

This chapter introduces the addition methods of different data in CoProcess 2025. The software supports loading and displaying point cloud data, vector data, raster data, and 3D model data.

3.1.1.1 Add Point Cloud

Point cloud data supports adding different formats such as las, laz, hpc, and codata.

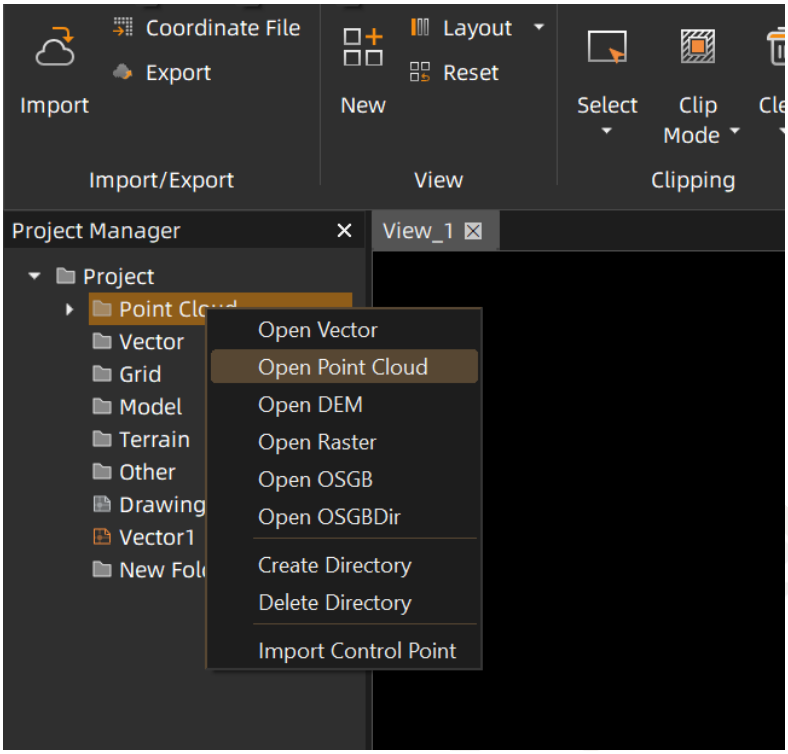
Method 1: Click "Import" in the "Base" function panel, select the point cloud data to be opened.



Figure：Open PointCloud

Method 2: In the folder, select the data to be added, hold down the left mouse button, drag it to the software interface, and release the mouse to add.

Method 3: In Project Manager, select the Point Cloud node, right-click, select Open Point Cloud, add the point cloud data to be loaded.



Figure：RightMenu-Open PointCloud

In the Project Manager list, select the corresponding data, right-click, and youcan perform operations such as "Close", "Redirect", "Open File Directory", etc.

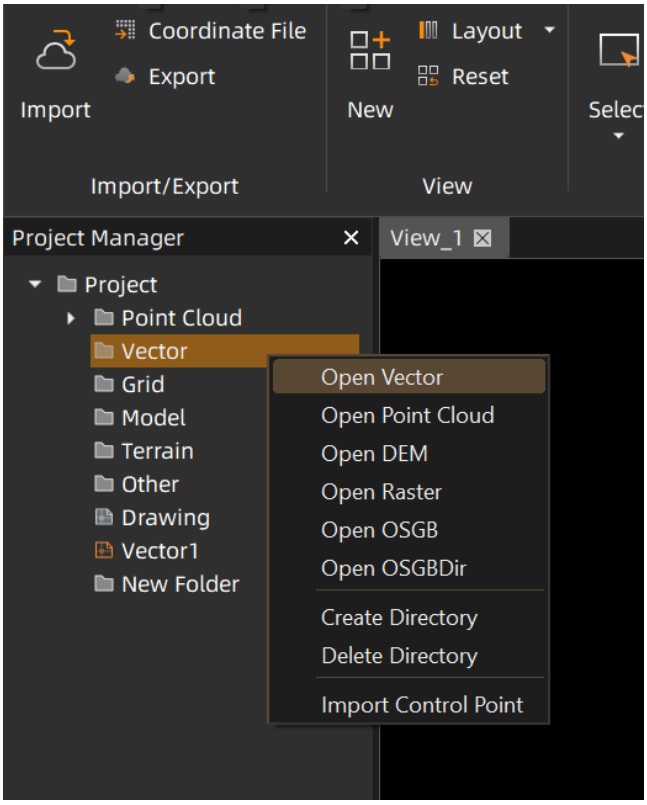
3.1.1.2 Add vector Data

Vector data addition:

Vector data supports adding different formats such as dwg and dxf.

Method 1 In the folder, select the data to be added, hold down the left mouse button, drag it to the software interface, and release the mouse to add.

Method 2: In Project Manager, select the Vector node, right-click, select Open Vector, add the vector data to be loaded.



Figure：Open Vector

In the Project Manager list, select the corresponding data, right-click, and you can perform operations such as "Close", "Redirect", "Open File Directory", etc.

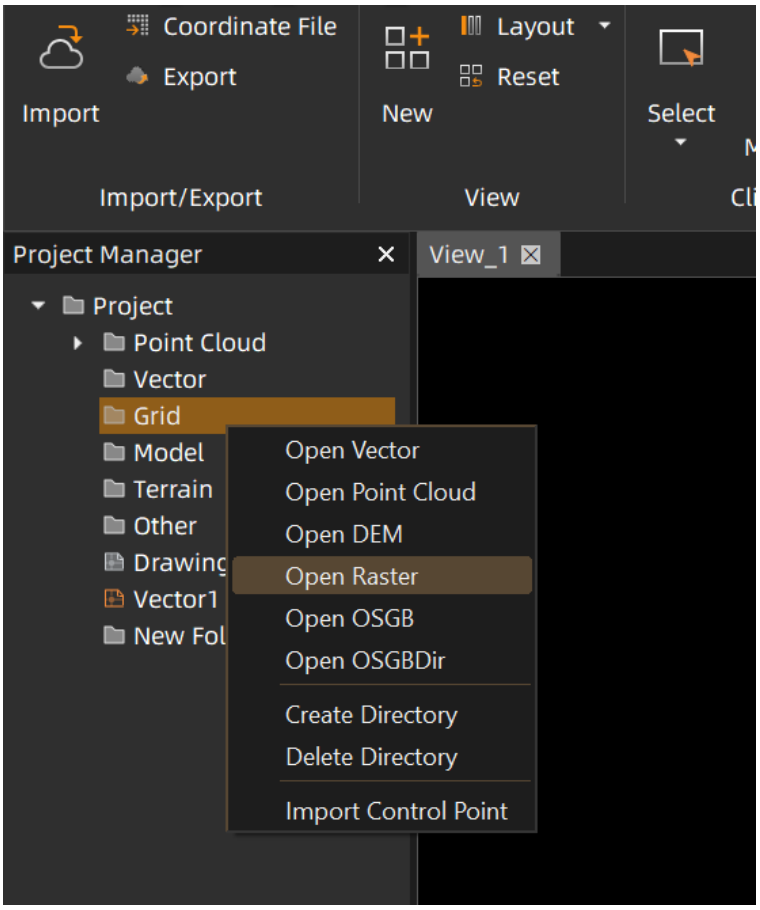
3.1.1.3 Add Raster Data

Raster data addition:

Supports adding images, DEM, etc., with formats including jpg, jpeg, tif, tiff, bmp, png, etc.

Method 1: In the folder, select the data to be added, hold down the left mouse button, drag it to the software interface, and release the mouse to add.

Method 2: In Project Manager, select the Raster node, right-click, select Open DEM or Image, add the raster data to be loaded.



Figure：Open Raster

In the Project Manager list, select the corresponding data, right-click, and you can perform operations such as "Close", "Redirect", "Open File Directory", etc.

3.1.1.4 Add Model Data

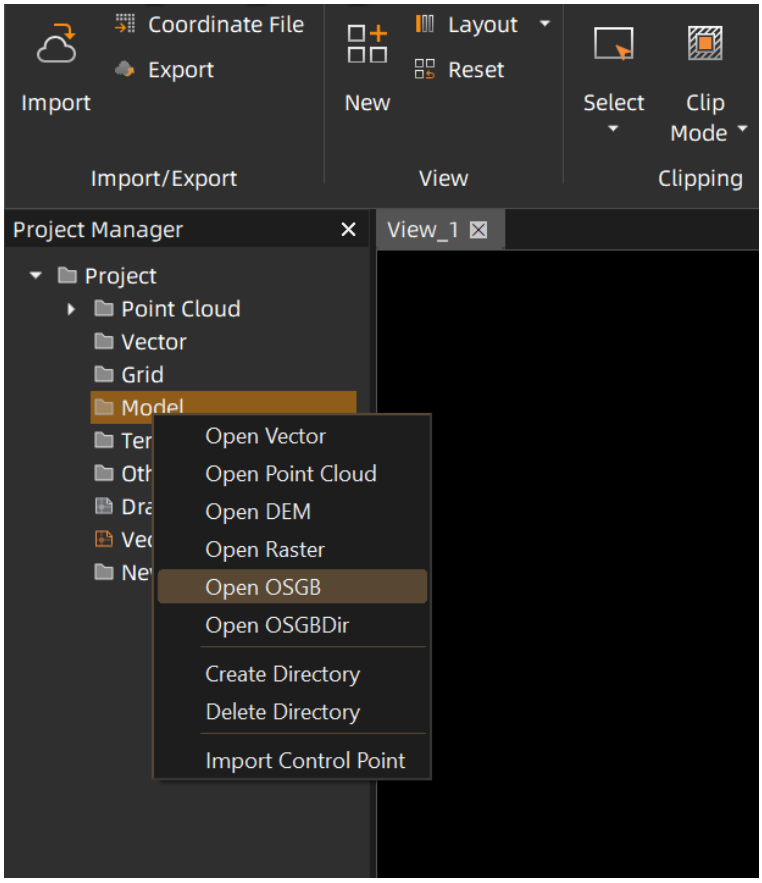
Model data addition:

Model data supports adding model data in .osgb format by adding files and folders.

Method 1: In the folder, select the data to be added (.osgb or folder), hold down the left mouse button, drag it to the software interface, and release the mouse to add.

Method 2: In Project Manager, select the Model node, right-click, select Open OSGB Model or Open OSGB Dir, add the model data to be loaded, and click confirm. (Wh

en selecting a folder, you can select it to the OSGB or Data level)



Figure：Open OSGB

In the Project Manager list, select the corresponding data, right-click, and you can perform operations such as "Close", "Redirect", "Open File Directory", etc.

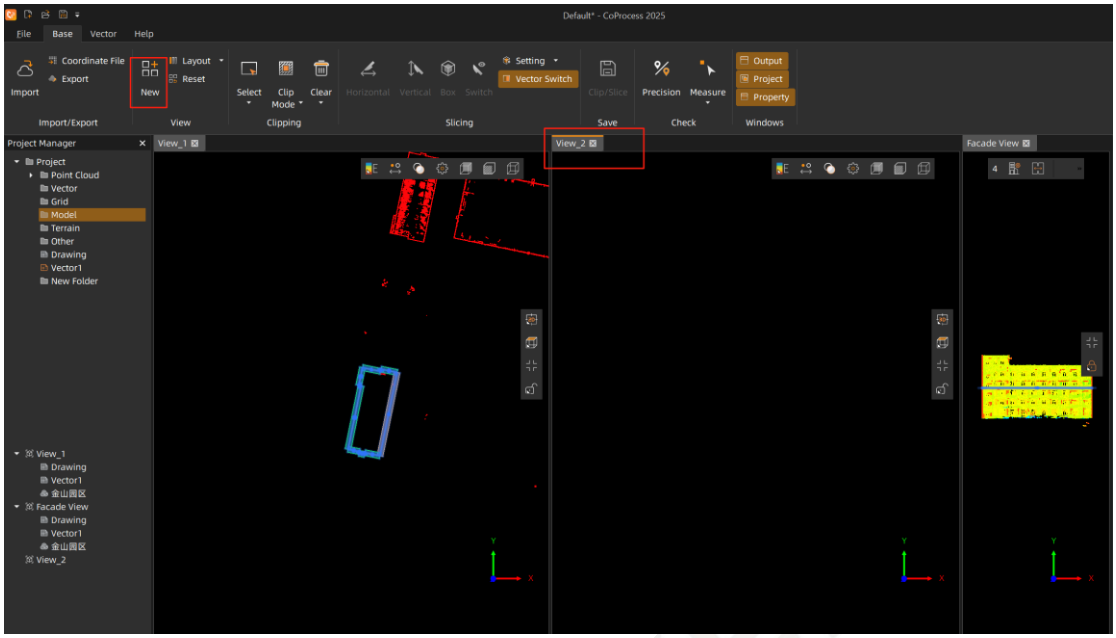
3.1.1.5 Multi-View Settings

Multi-view settings:

The software supports multi-view loading and browsing of data, and supports up to 4 views to be displayed simultaneously.

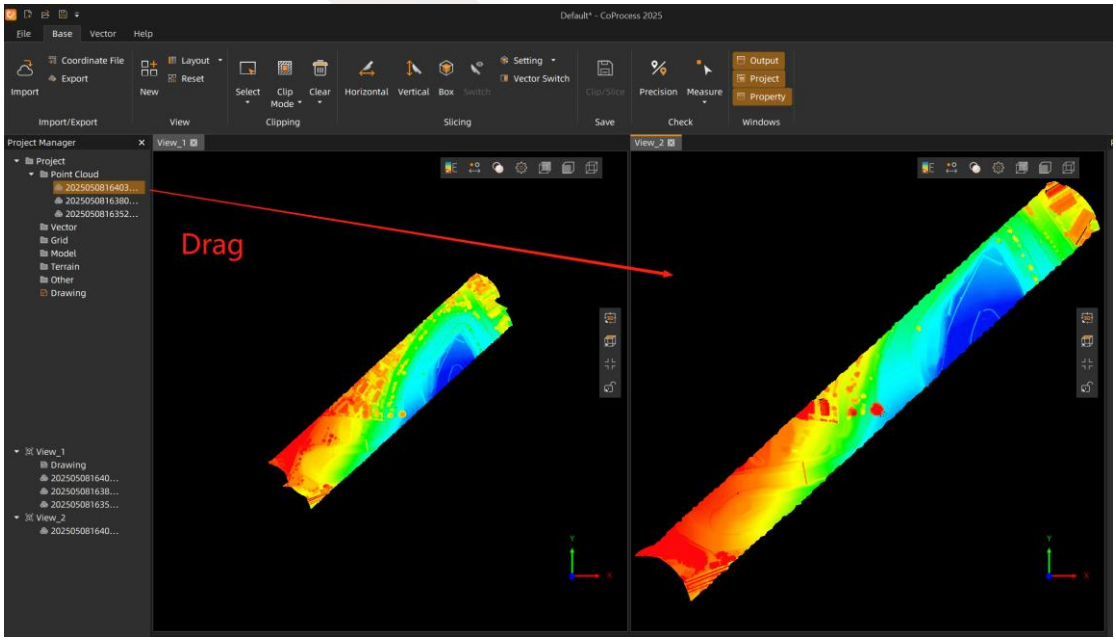
Operation method:

Add view: Click "New" in the menu bar, and a new empty view will be added to th e software interface. Click continuously to continue creating new views, up to four.



Figure：New View

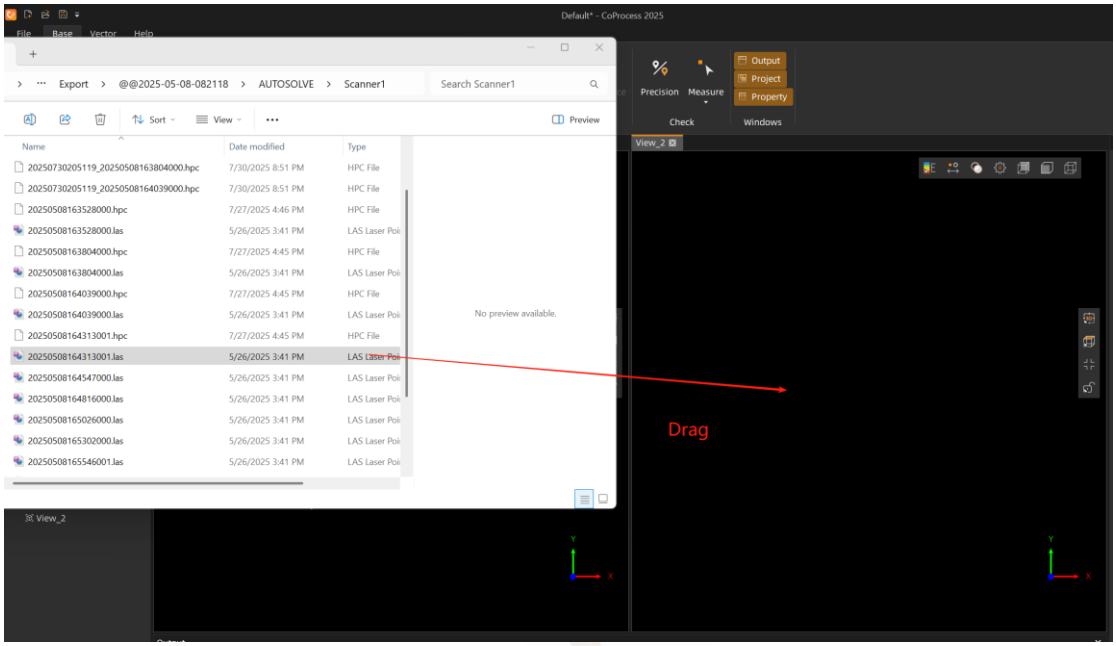
Add data: In the Project Manager list, select the data to be added to View 2, hold d own the left mouse button, drag it to the interface of View 2, and release the mouse. At the same time, the added data will be displayed in the list of View 2.



Figure：Add data to view

Or in the folder where the file is located, select the data to be added and drag it to

View 2 to complete the data addition, and the added data will be displayed in the Pr oject Manager list and the list of View 2.



Figure：Add data to ViewNode

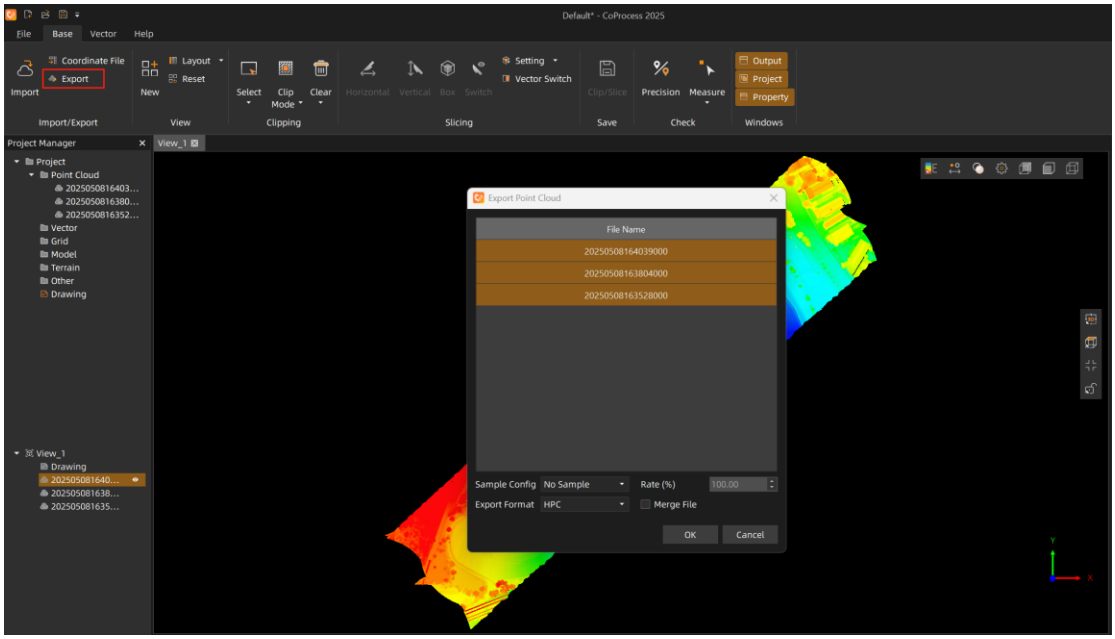
In the view list, select the corresponding data and right-click to center, show/hide, re move, etc.

3.1.2 Point Cloud Merging

This chapter introduces how to merge point clouds in CoProcess 2025. Currently, whe n data in formats such as las, laz, and codata are added to CoProcess 2025, the soft ware will automatically convert the data format to hpc.

□ Add point cloud data, and add the point cloud data (two or more) to be merged t o the software.

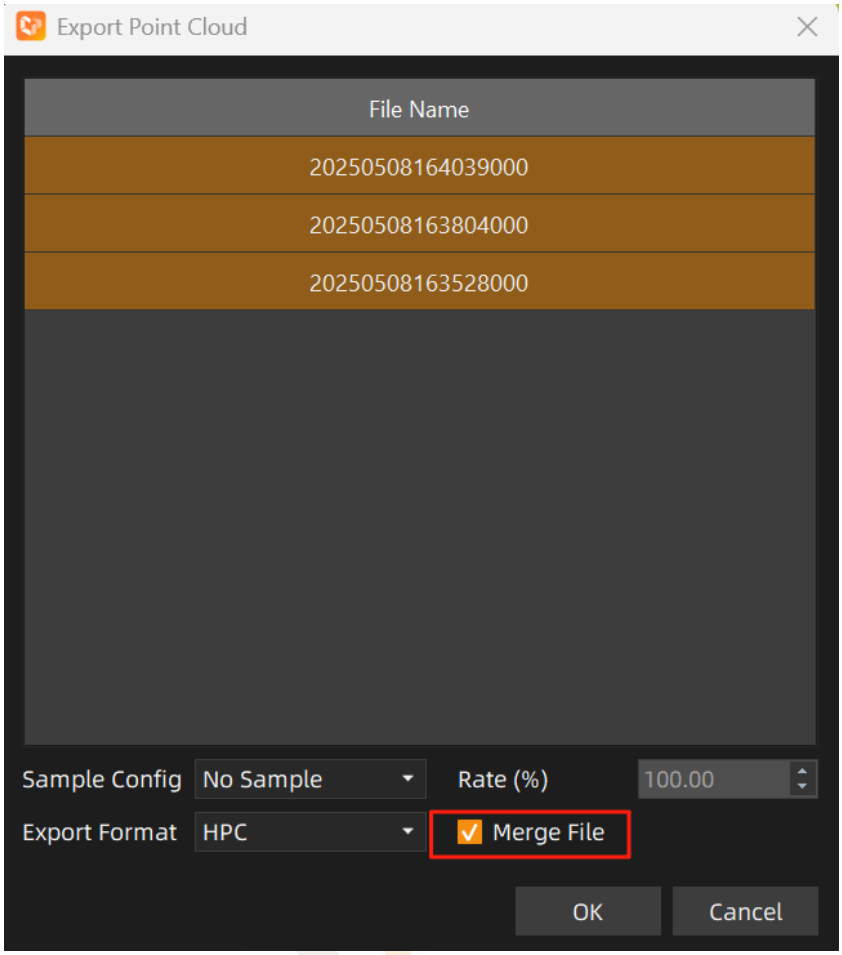
□ Click "Export" in the Base module, and select the point cloud data to be merged i n the data list. The selected data will be highlighted in orange.



Figure：Export PointCloud

□ Parameter settings, including sampling settings, sampling rate, export format, and merge into a single file. Here, we can set the parameters according to actual needs. For example, when the sampling setting is random sample, the corresponding sampling rate can be set; when it is grid sample, the grid space can be set. At the same time, the exported point cloud format can be set to hpc or las, and when las is selected, the corresponding version can be set.

When merging point clouds, it is critical to check "Merge File".



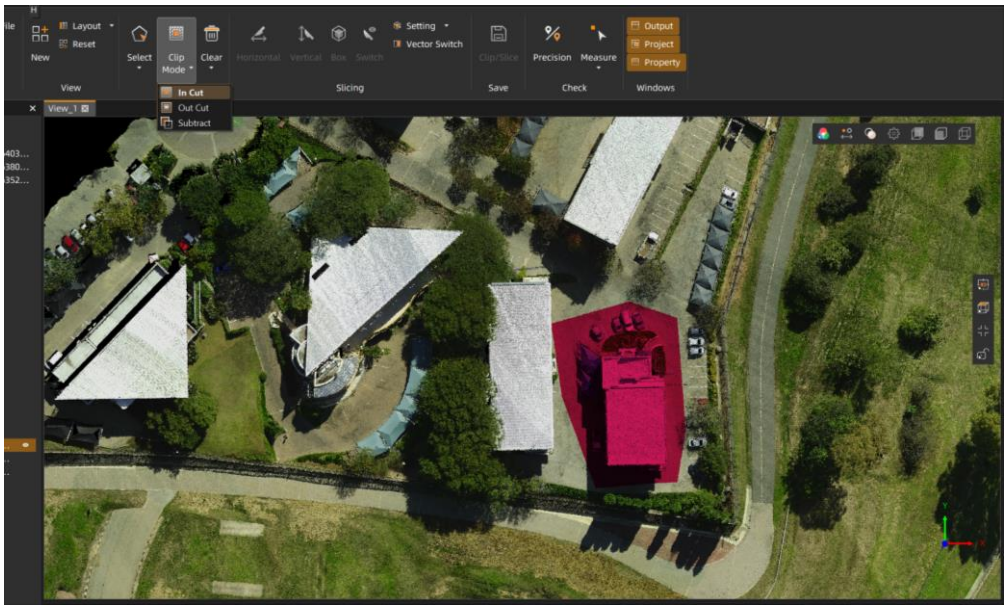
Figure：Merge data to single file

□ Export path selection. After confirming the point clouds to be merged and the export parameters, click "Ok", select the export path, and name the exported point cloud. Then the point cloud merging operation can be completed.

3.1.3 Point Cloud Clipping

This chapter describes how to perform point cloud clipping operations in the software, including general clipping and slice clipping, and exporting the clipped point cloud.

Point cloud clipping: In the Base module, use the selection function to select the point cloud to be clipped or retained. The selected point cloud will be displayed in red.

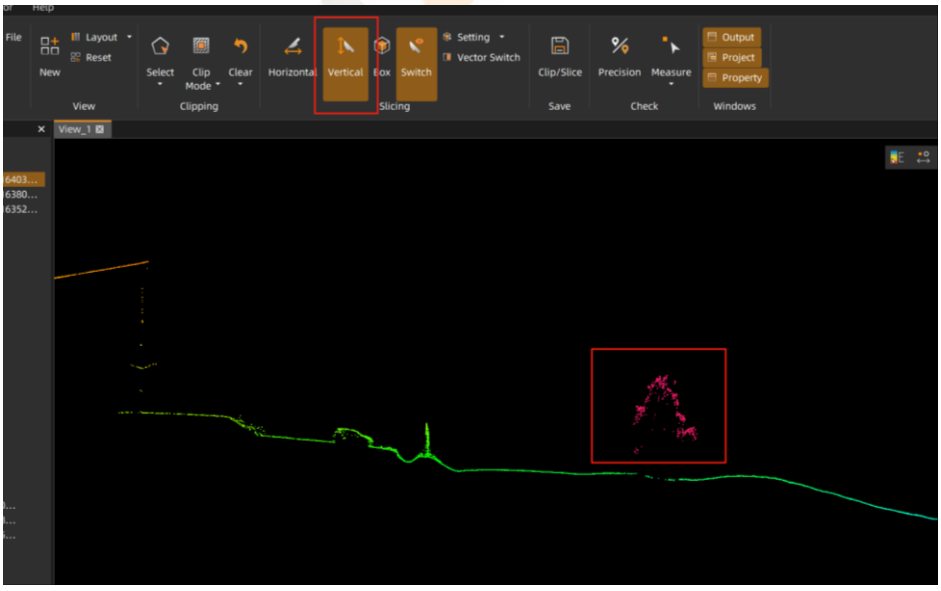


Figure：Select Cropping Selection

Select Inner Clipping in Clipping to complete the point cloud clipping.

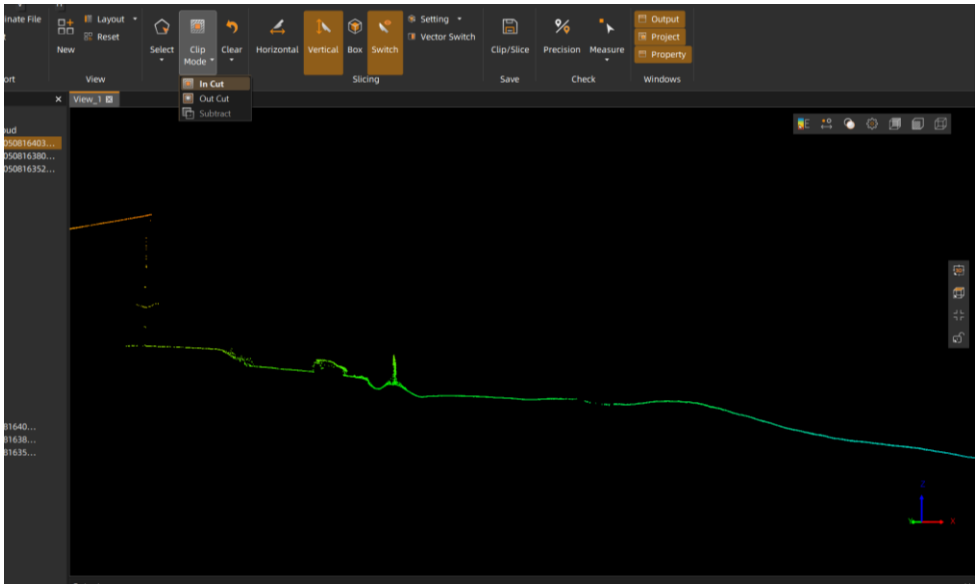
Slice clipping: The software also supports point cloud clipping after slicing.

□ Use the slicing function to slice the point cloud. Here, use vertical slicing to cut o ut the point cloud.



Figure：Vertcial Slice

□ Use the selection function to select the point cloud to be deleted, then use Inner C lipping to delete the selected point cloud.



Figure：Select Cropping Selection

□ After deleting the noise points in the current slice, you can click Forward or Back ward in the slice settings on the right to adjust the position of the slice, and repeat s tep □ to continue deleting noise points.

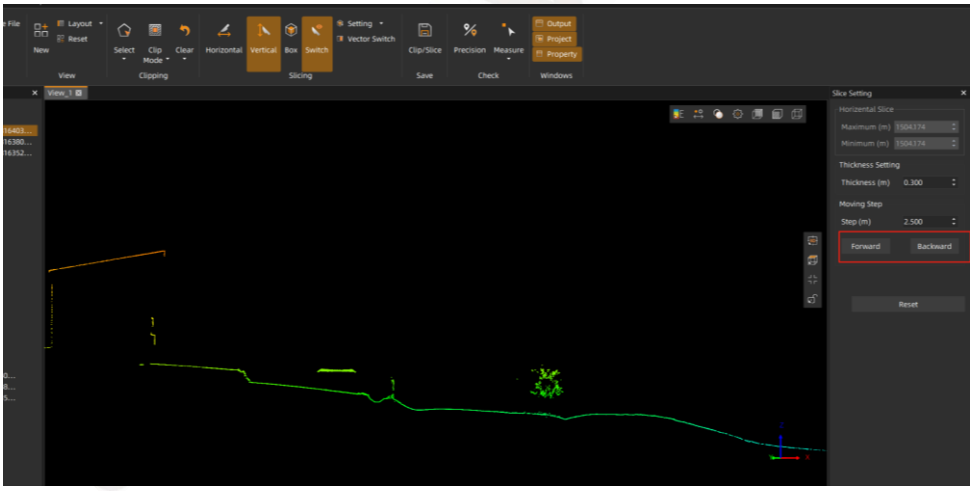


Figure: Internal Cropping

□ Click Export to complete the export of the clipped point cloud.

□ Slice point cloud export: The export of slice point cloud is slightly different from t hat of clipped point cloud. The slice point cloud export only exports the point cloud after the current slice.

3.1.4 Precision Check

This chapter introduces how to perform precision check in CoProcess 2025. The softw are supports precision check of point clouds, Mesh models, orthophotos, and other dat a.

For precision check, after adding data to the software, click "Precision" in Check to p op up the precision check function panel.

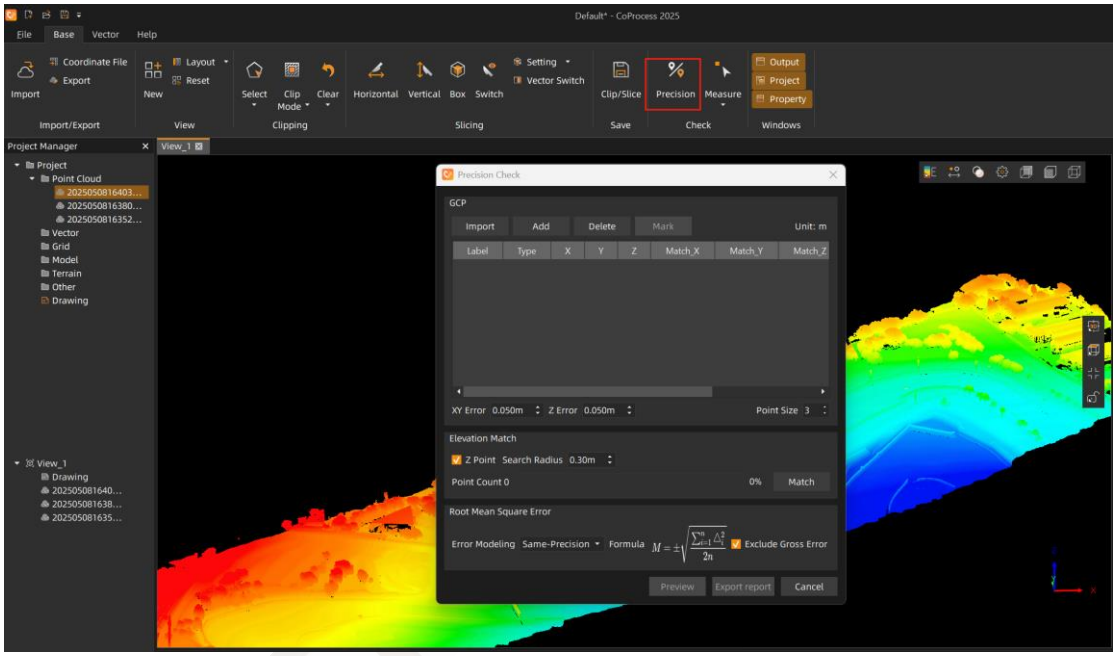


Figure: accuracy inspection

Import the control point file. The coordinates of the control point file must be consist ent with the coordinate system of the added data.

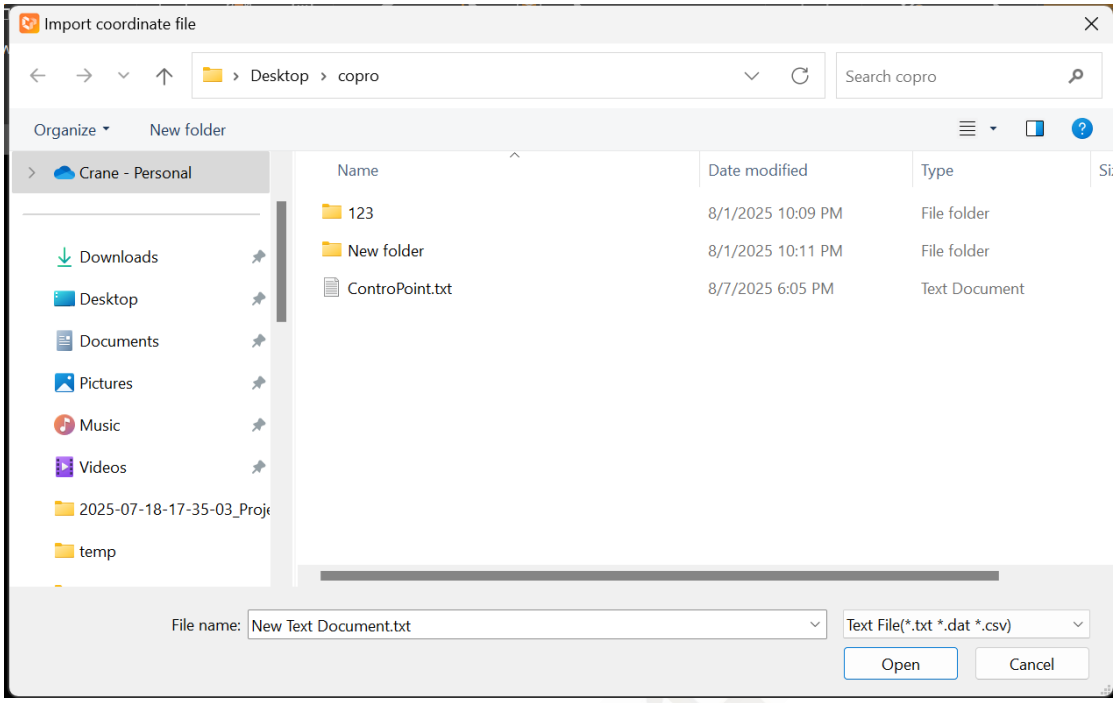


Figure: Choose Control-point File

In the import interface, first select the delimiter to ensure that the imported control po ints are separated by columns, then specify the attributes of each column (point name, X, Y, Z coordinates, etc.), and click "Open" after setting to add data.

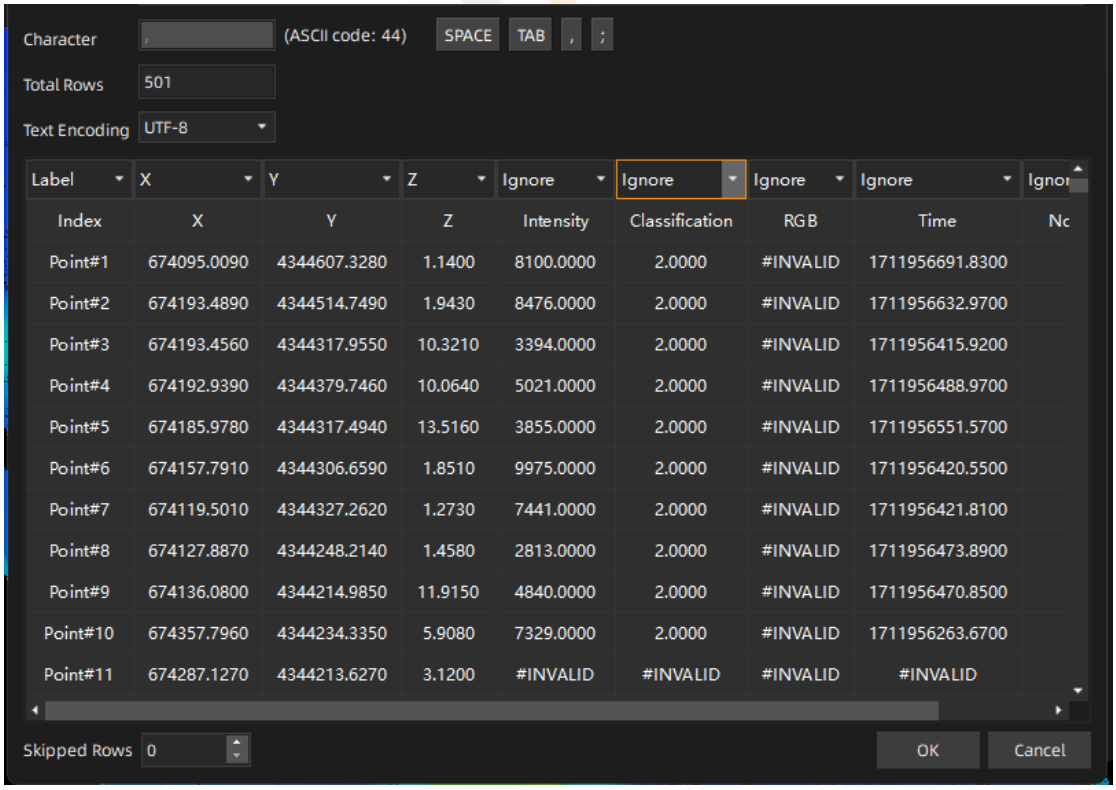


Figure: Specify Column Property

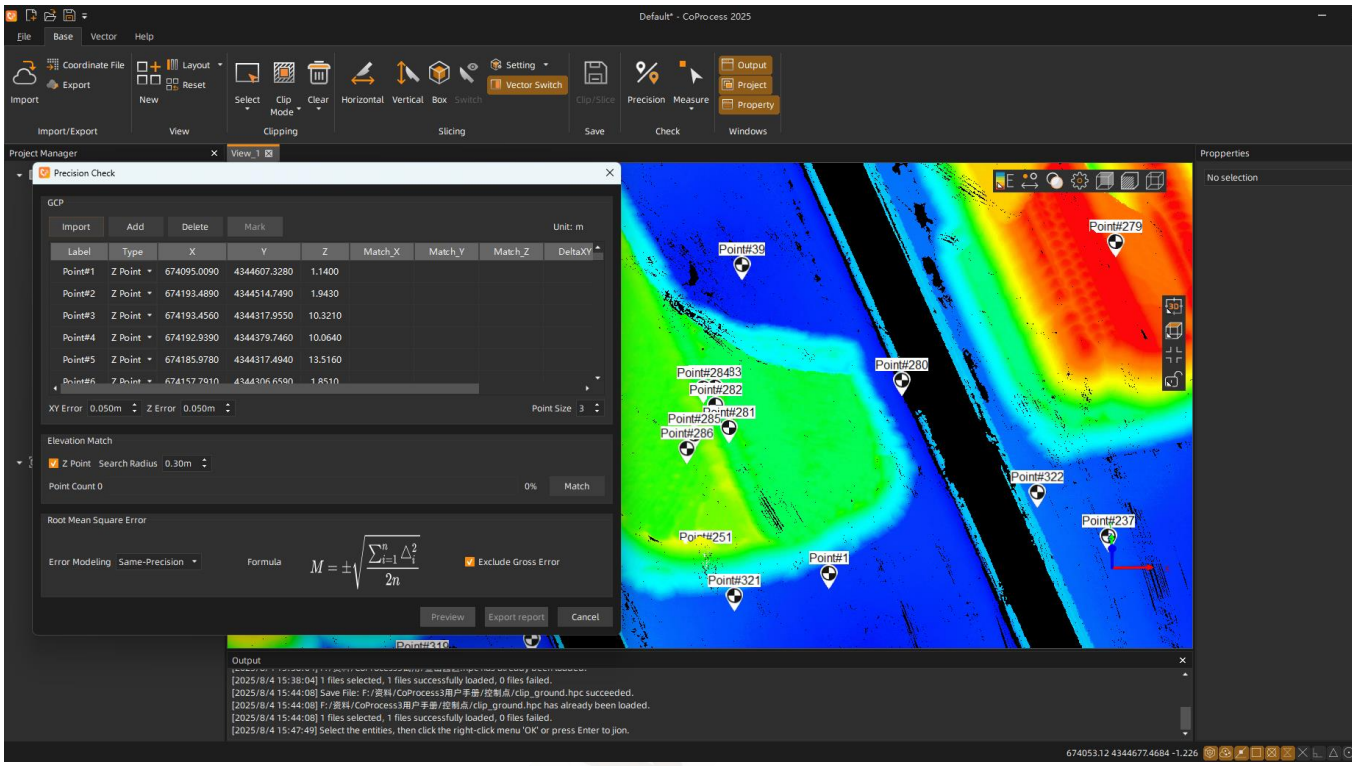


Figure: Add Control-points

After importing control points, set the point type according to the actual inspection re quirements. It can be set to elevation point, plane point, and 3D Point, corresponding to elevation inspection, plane inspection, and elevation and plane inspection respectivel y.

Set the plane RMSE limit and elevation RMSE limit. If exceeding the limit, it will b e displayed in yellow or red in the control point list.

 If only elevation inspection is needed, after setting all point types to elevation poin ts, use the elevation matching function to quickly match elevation points. Check the e levation point checkbox and click Match.

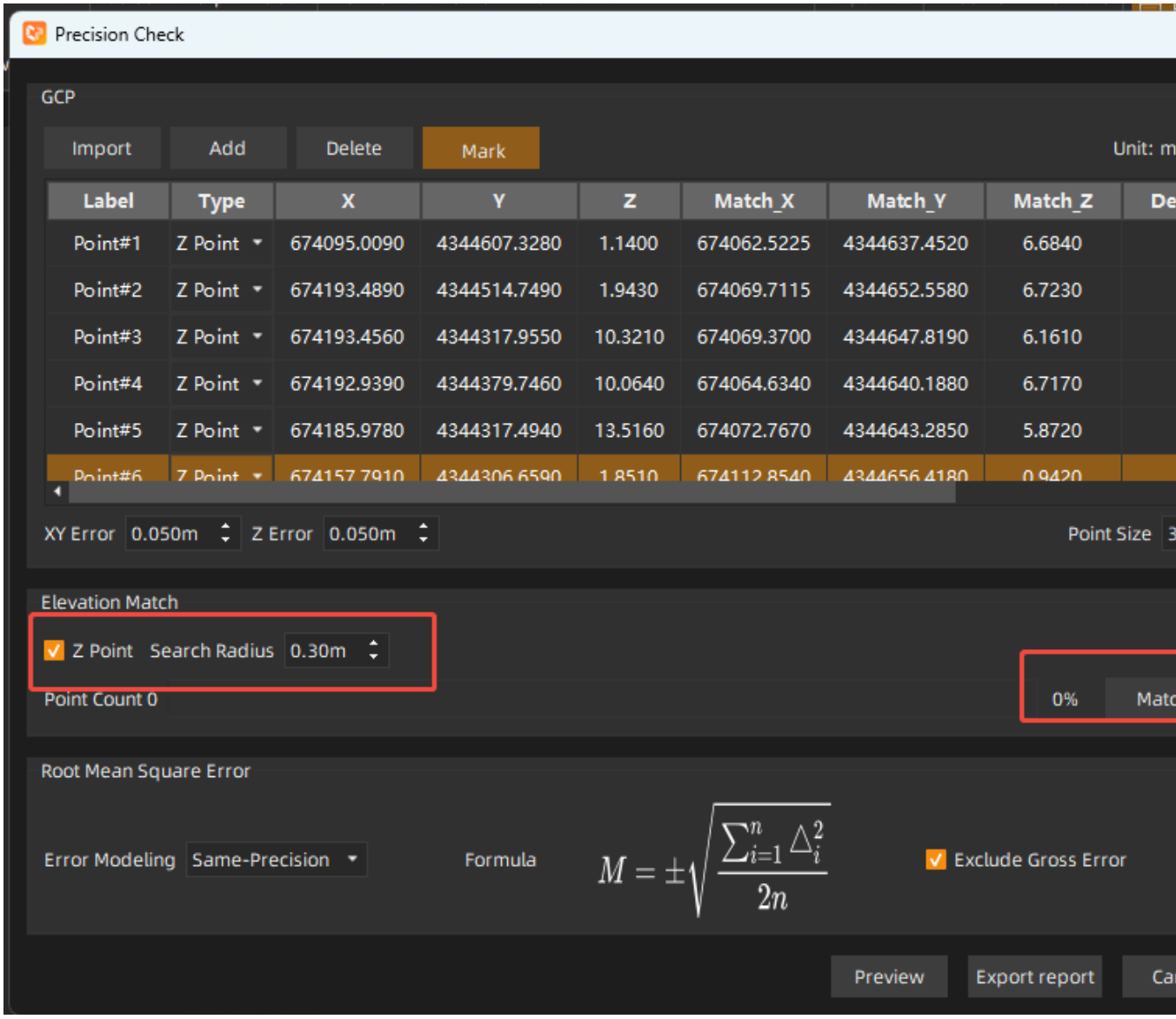


Figure: Match

After the matching is completed, in the control point list, Match_X, Match_Y, and Match_Z display the corresponding values of the matched points, as well as the corresponding elevation differences.

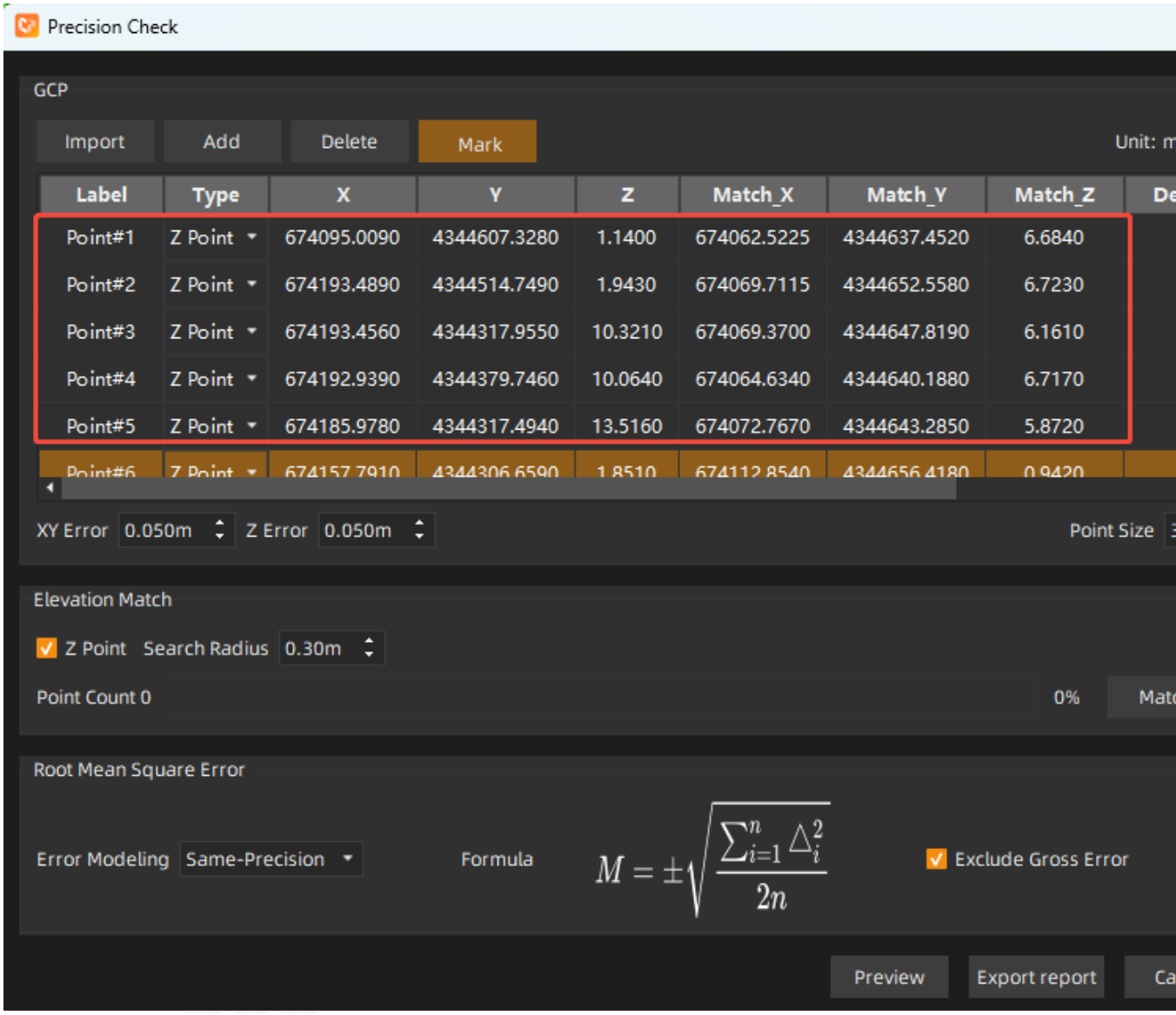


Figure: Match Result

Click Export Report to output the result report.

□ For plane and 3D point (plane and elevation) inspection, if plane or 3D point insp ection is required, after setting the type of control points, point picking operation is r equired to confirm the matching points.

Click the "Mark" function button to activate the point picking function. In the control point list, select the control point to be picked, right-click, locate, and jump to the vi cinity of the control point.

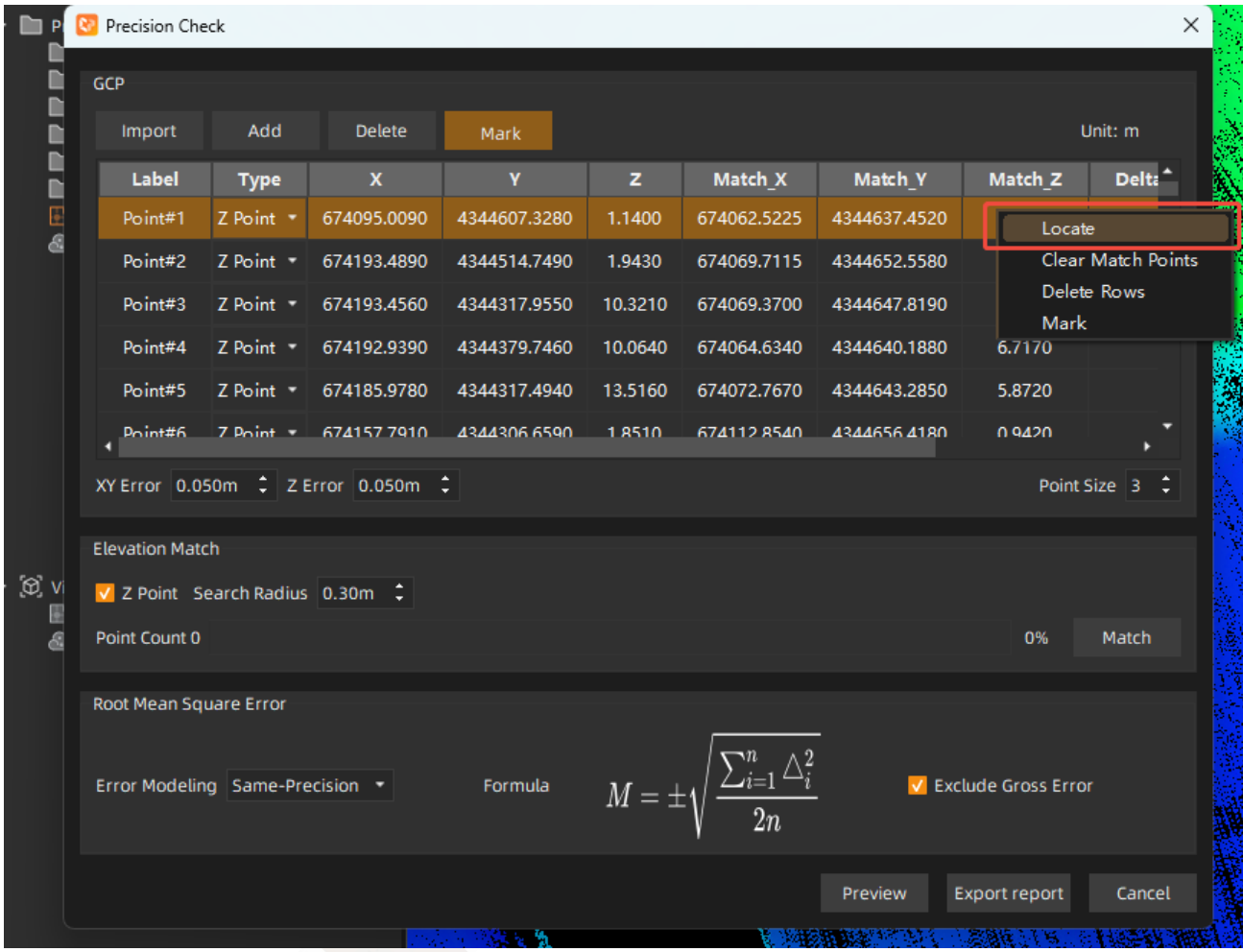


Figure: Jump to the control point position

Then click the left mouse button on the corresponding position on the point cloud, m odel, or orthophoto to pick the point. After point picking is completed, the coordinate s of the matching point and the differences in XY and elevation are displayed in the control point list. At the same time, the matching point is displayed at the point picki ng position (Points prefixed with "M" are matching points).

If the position of the picked point is incorrect during point picking, you can continue picking points to overwrite the previous matching points. If a certain point is not to b e inspected, you can right-click and delete the matching point. Perform point picking operations on all control points in turn.

After point picking is completed, select the corresponding required RMSE calculation method, click Preview to view the preview result, or directly click Export Report to o utput a PDF report.

3.2 Planar Drawing

Planar drawing is generally used to draw planar vector results of buildings based on i ndoor point cloud data. The general processing flow is as follows:

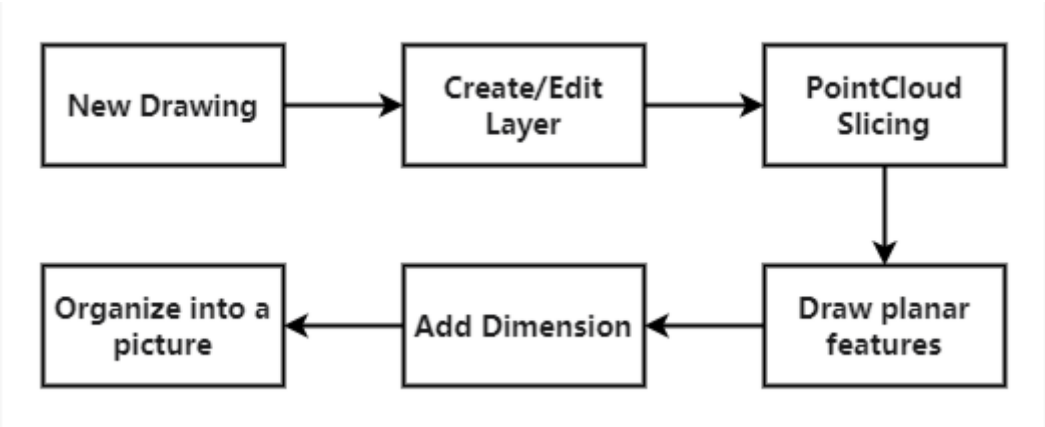


Figure: Plane Drawing Process

3.2.1 New Drawing

Before formally drawing planar elements, it is necessary to create a new drawing. The purpose of creating a new drawing is to store all the elements in this drawing.

Click "New" in the Vector menu bar, select the storage path, name the drawing, and click "Save" to complete the creation.

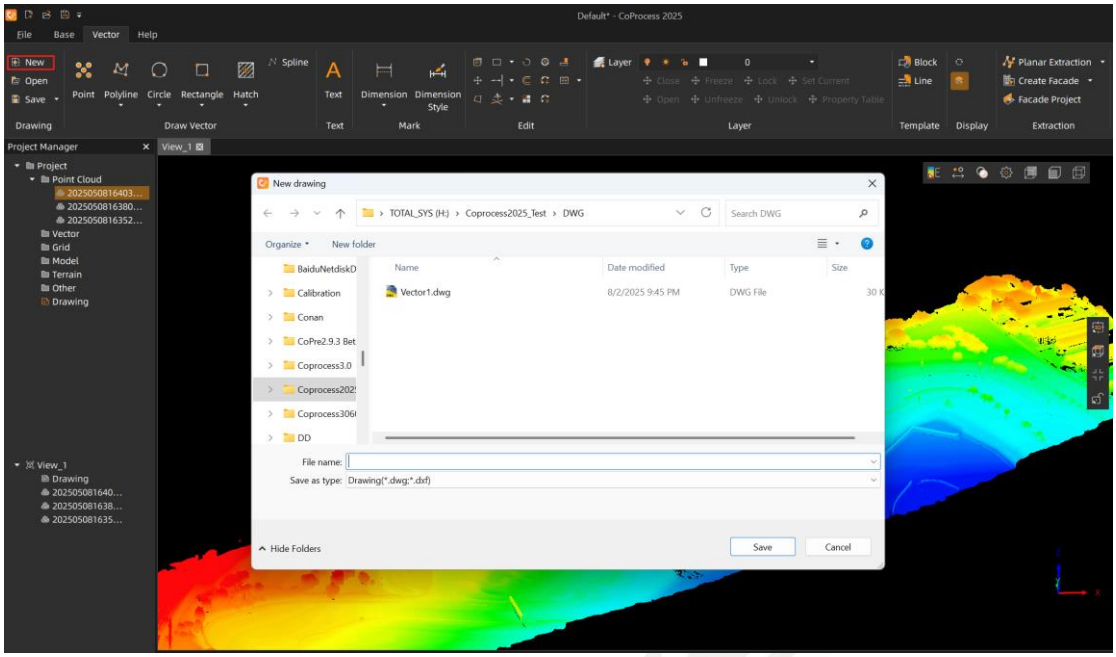


Figure: New Drawing

After creating a new drawing, right-click and activate the drawing. At this point, the small icon in front of the corresponding drawing will be highlighted, indicating an act ivated state.

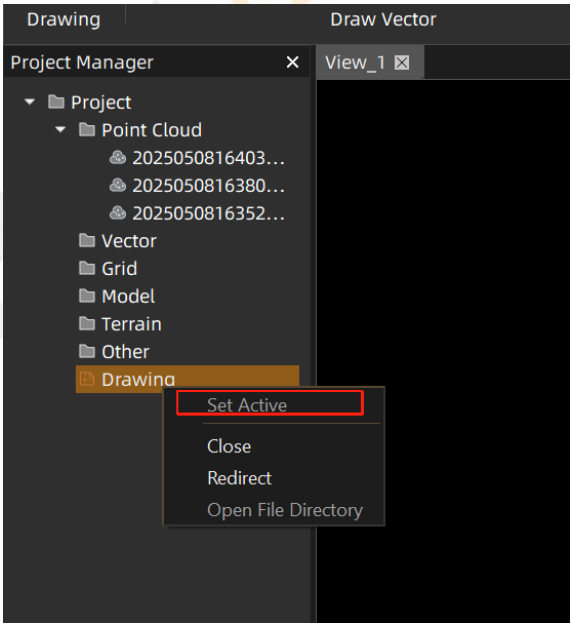


Figure: Set Active

Activate the drawing. After creating a new drawing, it is necessary to activate the dra wing so that the subsequently drawn elements will be saved in the corresponding acti vated drawing.

3.2.2 Create Layer

After the drawing is created, it is necessary to create different element layers according to the elements to be collected in the current data, such as walls, windows, doors, annotations, etc.

In the Vector menu bar, click the Layer button, and click New Layer in the Layer Manager panel.

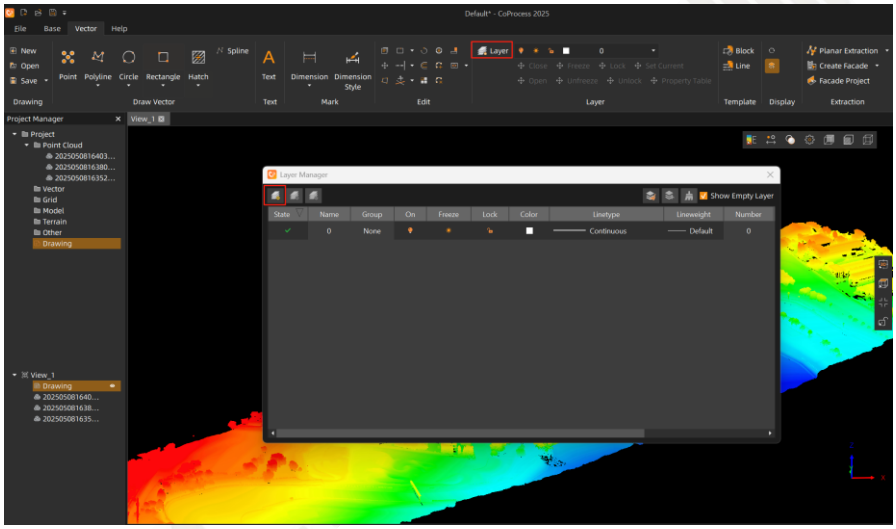


Figure: Create Layer

After creating a new layer, double-click the layer name to modify it, and click the color to modify the layer color to distinguish different elements.

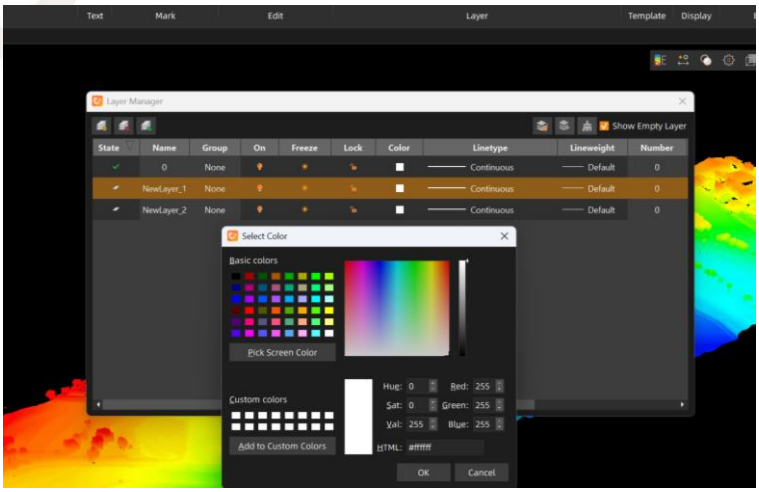


Figure: Modify Layer Color

3.2.3 Point Cloud Slicing

Before formally collecting planar elements, it is necessary to slice the added point clo ud data to better view and reference when drawing planar elements.

In the Base menu bar, click the Horizontal Slice function. The cursor turns into a kni fe shape, indicating that the function is activated. Click the left mouse button on the point cloud data to be horizontally sliced to slice.

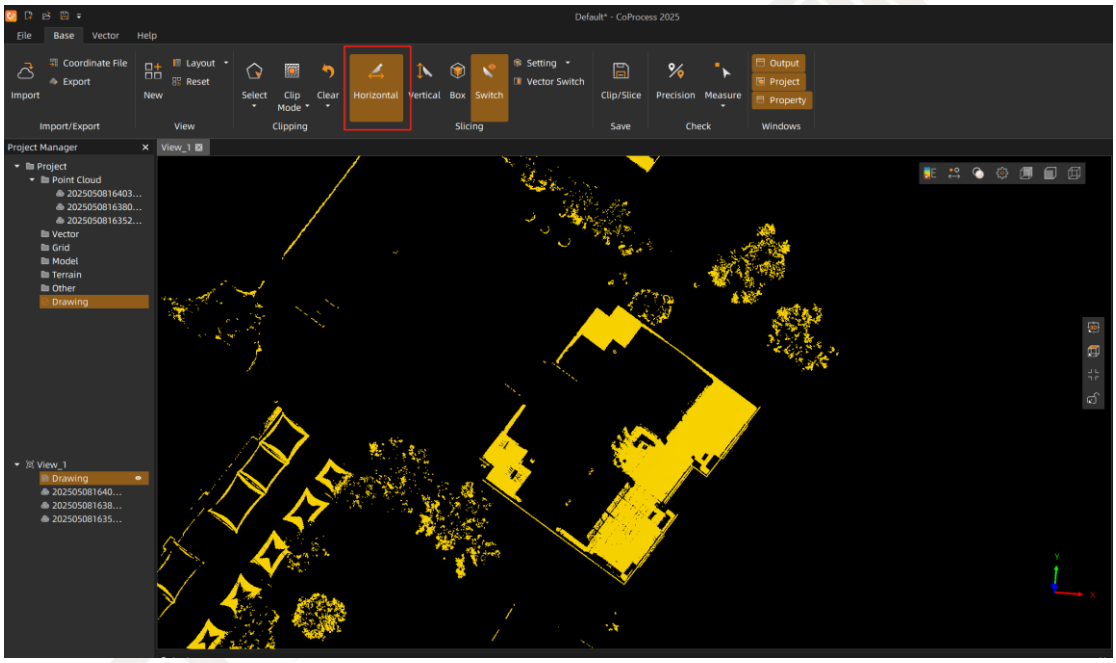


Figure: Horizontal Slice

Slice adjustment: Hold down "Ctrl" button and scroll the wheel to adjust the height o f the slice. Hold down the Shift key and scroll the wheel to adjust the thickness of t he slice. Or adjust the maximum and minimum values of the slice and the slice thick ness in the slice settings panel to adjust the slice.

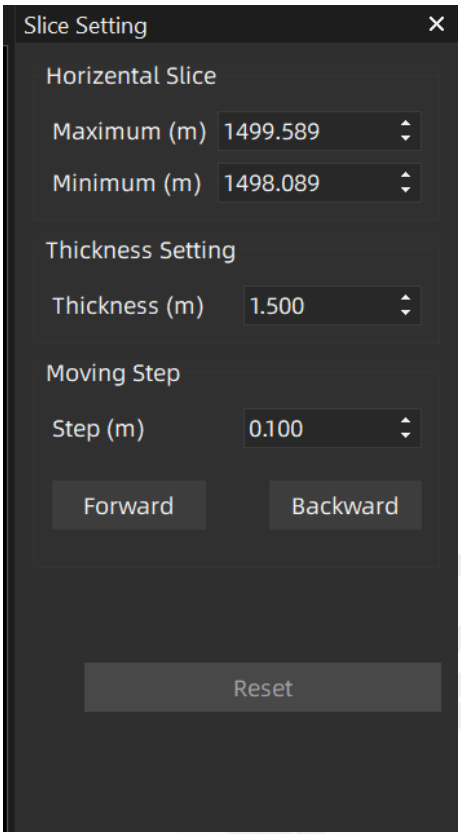


Figure: Slice Setting

The main purpose of slice adjustment is to obtain clear and complete planar contour information, which is convenient for element collection. During collection, the slice can be dynamically adjusted continuously, and the ultimate goal is to facilitate element drawing.

3.2.4 Planar Element Drawing

Planar Element drawing includes walls, windows, doors, annotations, etc. For easy viewing, the view can be set to 2D in the right view settings. At this time, the data can only be panned and rotated, not flipped.

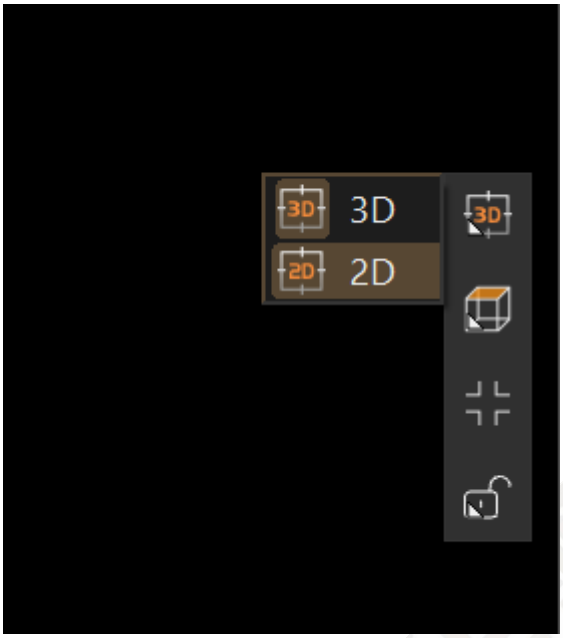


Figure: 2D View

Wall drawing: Before drawing, select the current layer as the element to be drawn in the layer menu bar. Here, to draw a wall, select the layer as Wall.

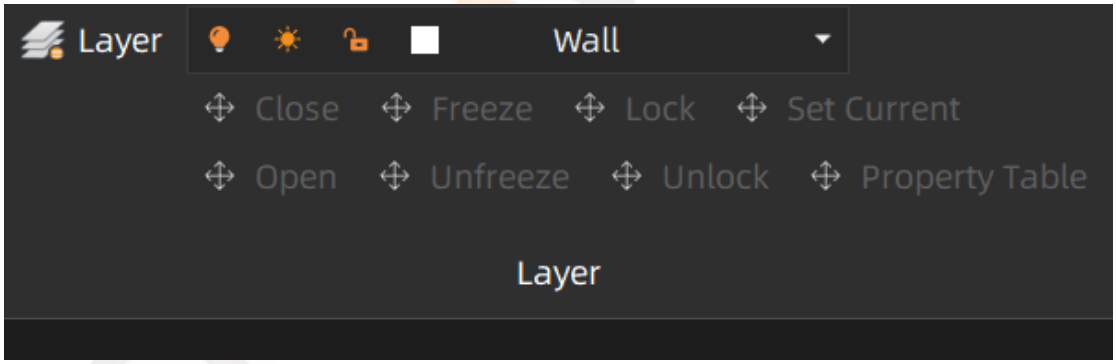


Figure: Set wall layer as current layer

For regular wall structures, you can use the right-angle mode for drawing. Click the d rop-down button of Polyline in the menu bar and select Right Angle Mode.

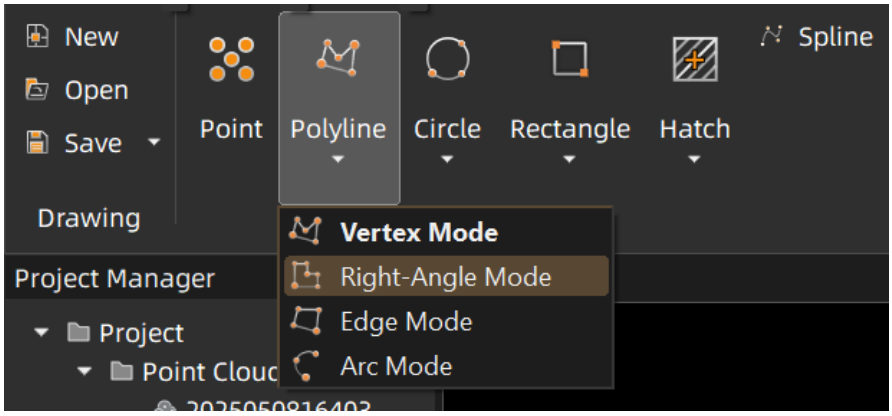


Figure: Right-Angle Mode

Start drawing on the point cloud. You can turn off point cloud snapping in the lower right corner when drawing, and try to draw along the center of the point cloud. When needing to turn, the software will automatically turn at a right angle.

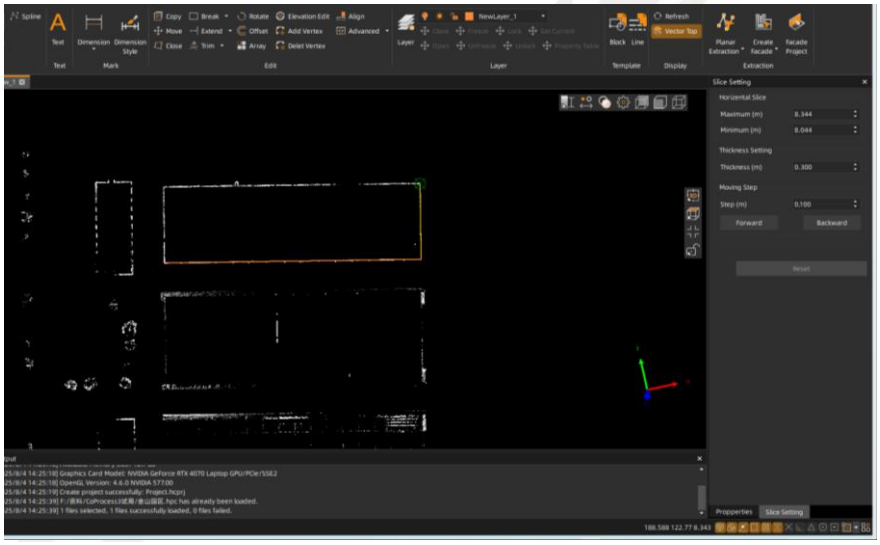


Figure: Right-Angle Mode

Double-click the left mouse button at the end of the drawing, or right-click and select "Ok" to end the drawing.

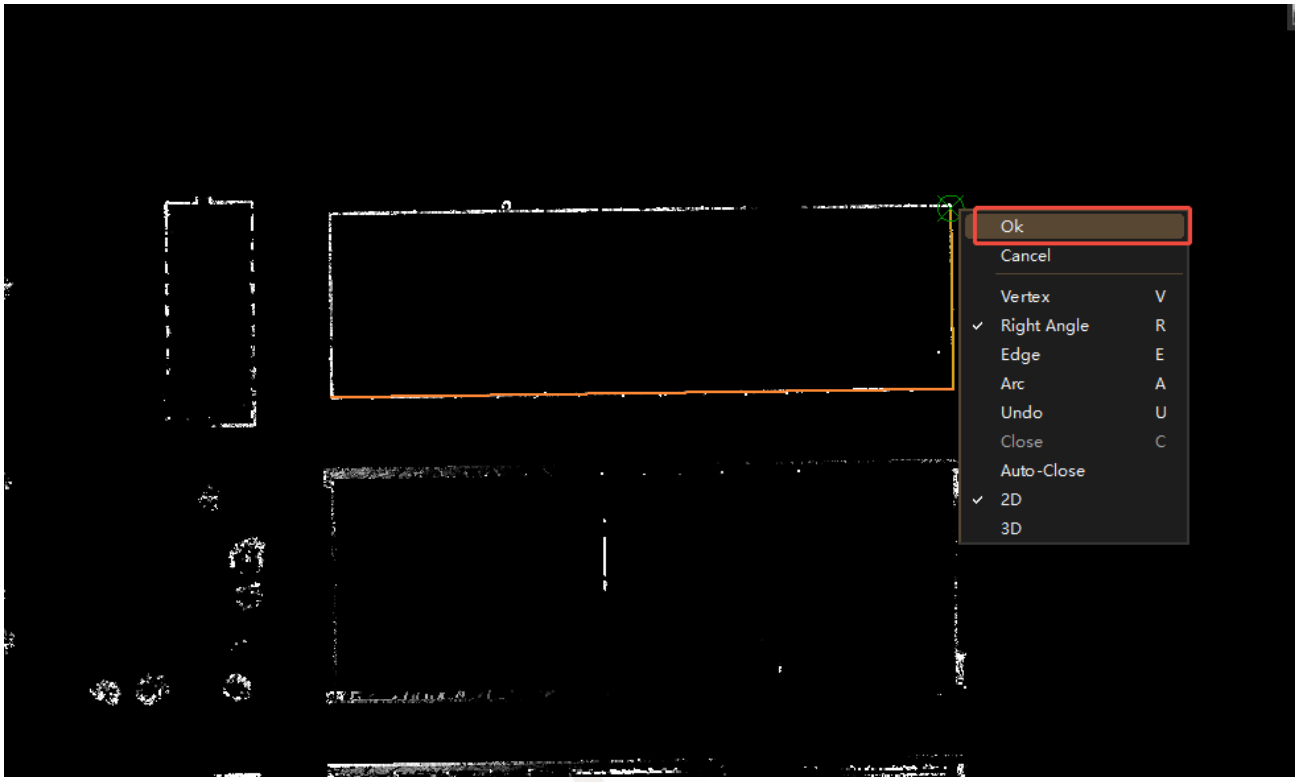


Figure: Finishing Drawing

Window drawing: Window drawing is similar to wall drawing. Before drawing, switch the layer to the Window layer. Use Vertex Mode in Polyline (the window here is irregular). When drawing, the first point of the window snaps to the endpoint of the previous wall, and then continue drawing.

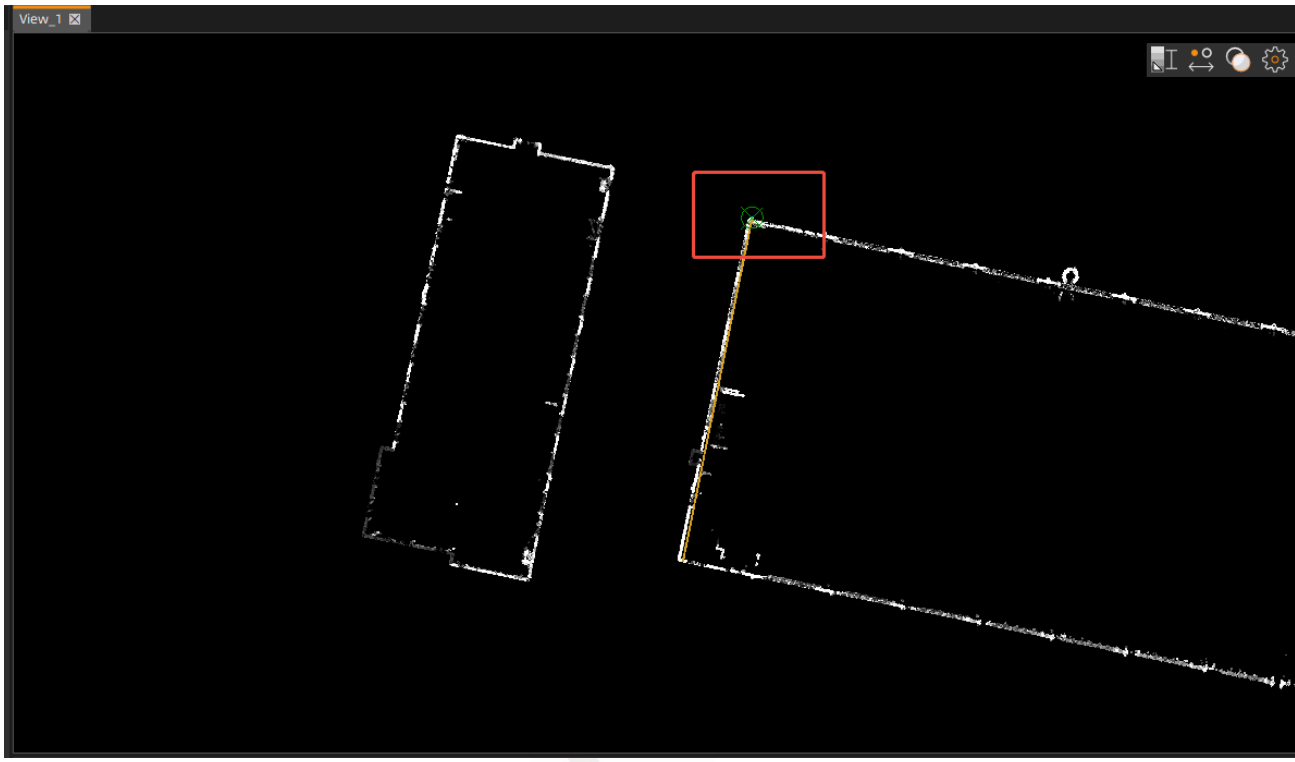


Figure: Vertex Mode

When it is necessary to switch the drawing mode during drawing, you can right-click and switch the polyline mode. For example, in this case, you can switch from Vertex Mode to Arc Mode to start drawing arcs and complete the window drawing.

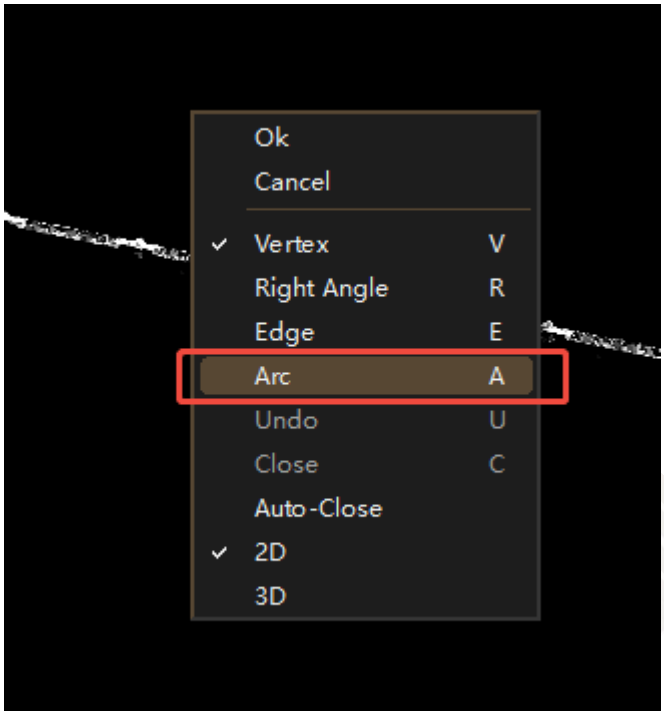


Figure: Switch to Arc Mode

Door feature : In the Vector menu bar, click Block in Template, select the door templ ate, and confirm the position of the door with three points.

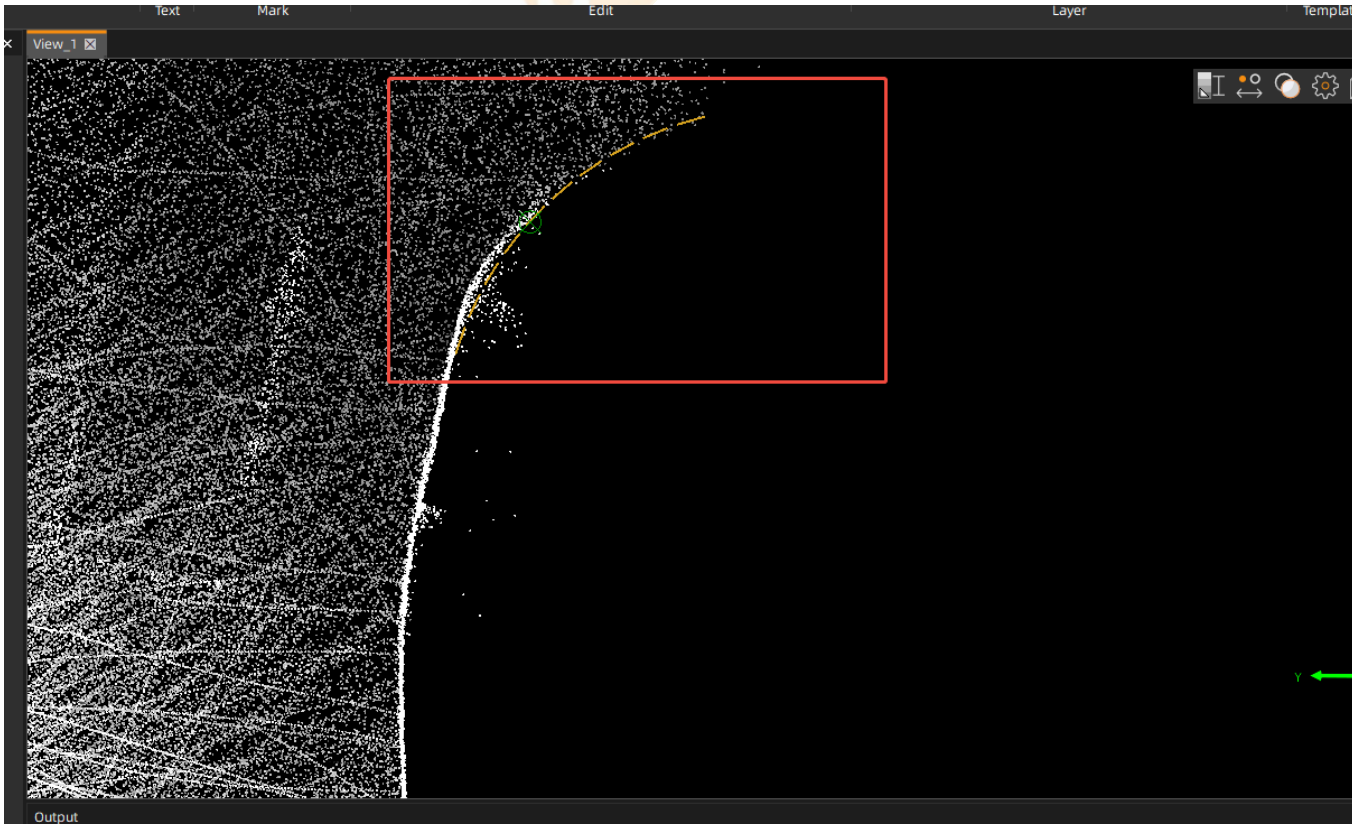


Figure: Arc Mode

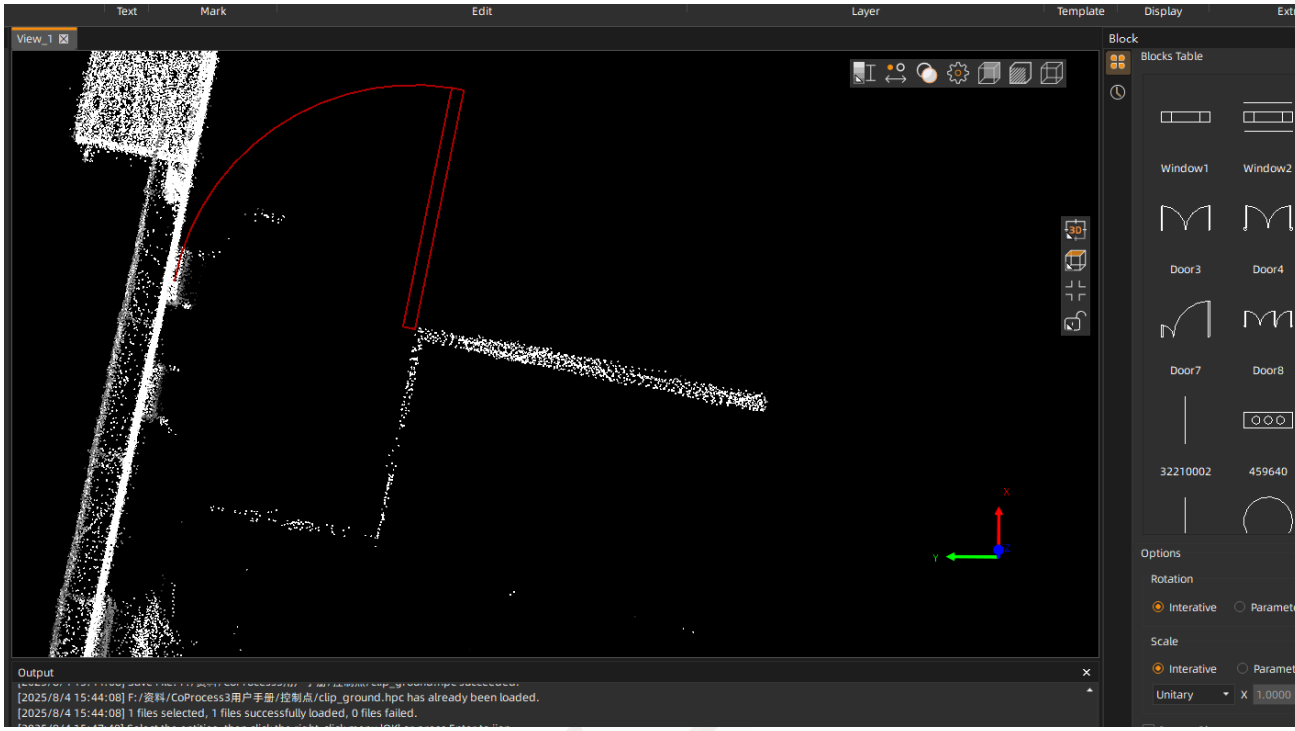


Figure: Drawing door

3.2.5 Add Annotation Features

Addition of annotation features:

Before annotation, you can set the annotation style, including text, unit, precision, etc. Here, set the precision to two decimal places. Click Apply.

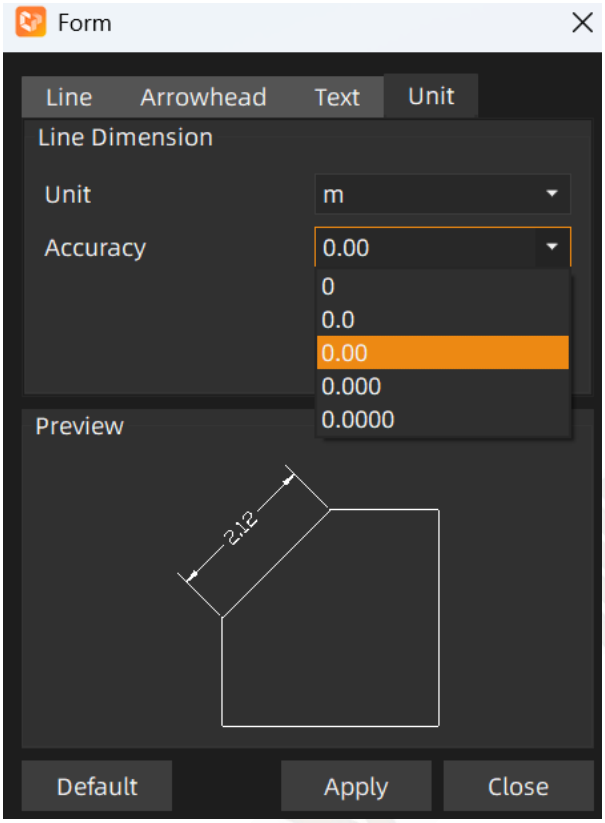


Figure: Set dimension style

Aligned dimension: Click the drop-down button of Dimension and select Aligned Dim ension to start annotating on the drawn elements.

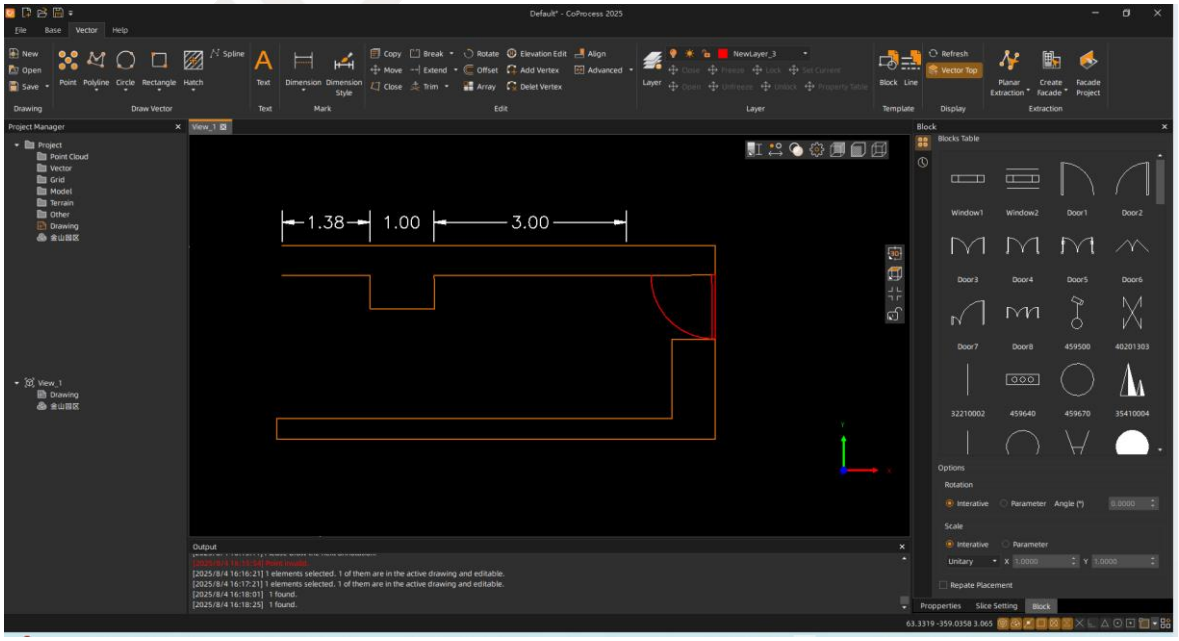


Figure: Drawing Align-Dimension

Area dimension: For a closed 2D area, you can directly select the inside of the close d area to calculate the area.

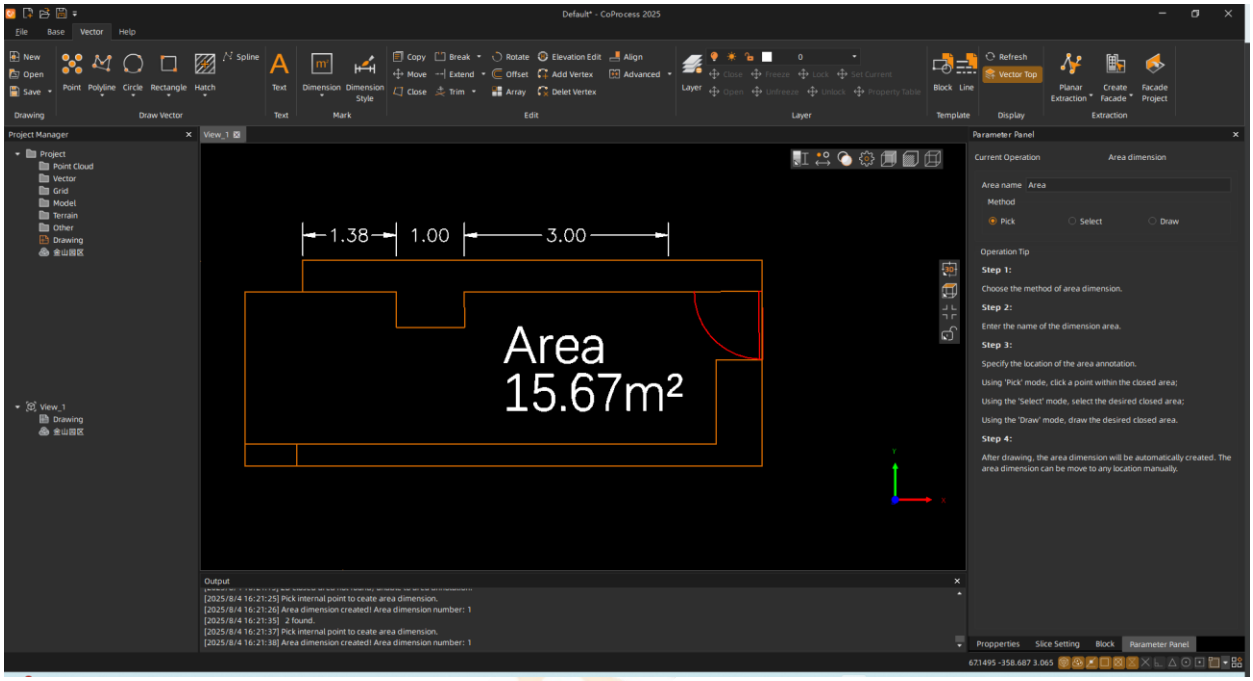


Figure: Drawing Area Dimension

Drawing Arrangement

After drawing the elements, it is necessary to arrange the drawing, including the outp ut of tables, files, and the output of the drawing frame.

For table drawing, first draw the number of rows and columns of the table according to the content to be filled in the table. Use line drawing and offset functions in the s oftware to draw the table.

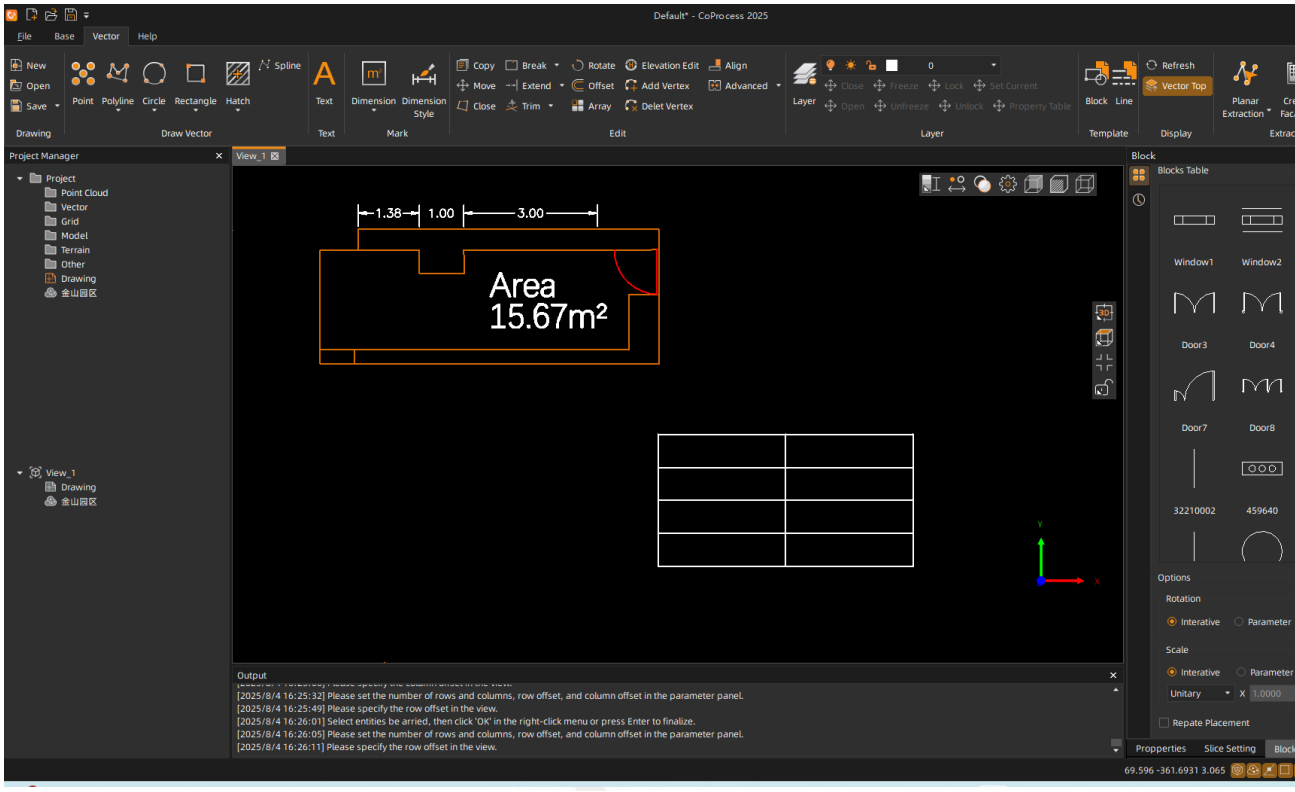


Figure: Drawing Table

Fill in the table content: Use the Text function to fill in the corresponding informatio n in the table.

Click the Text function, create the starting point, direction, and size of the text in thr ee points, and then enter the text.

Figure: Drawing Text

Drawing Frame: Use the Rectangle drawing function to frame the icon and the drawn vector, then use the Offset function to offset a rectangle to complete the drawing fra me.

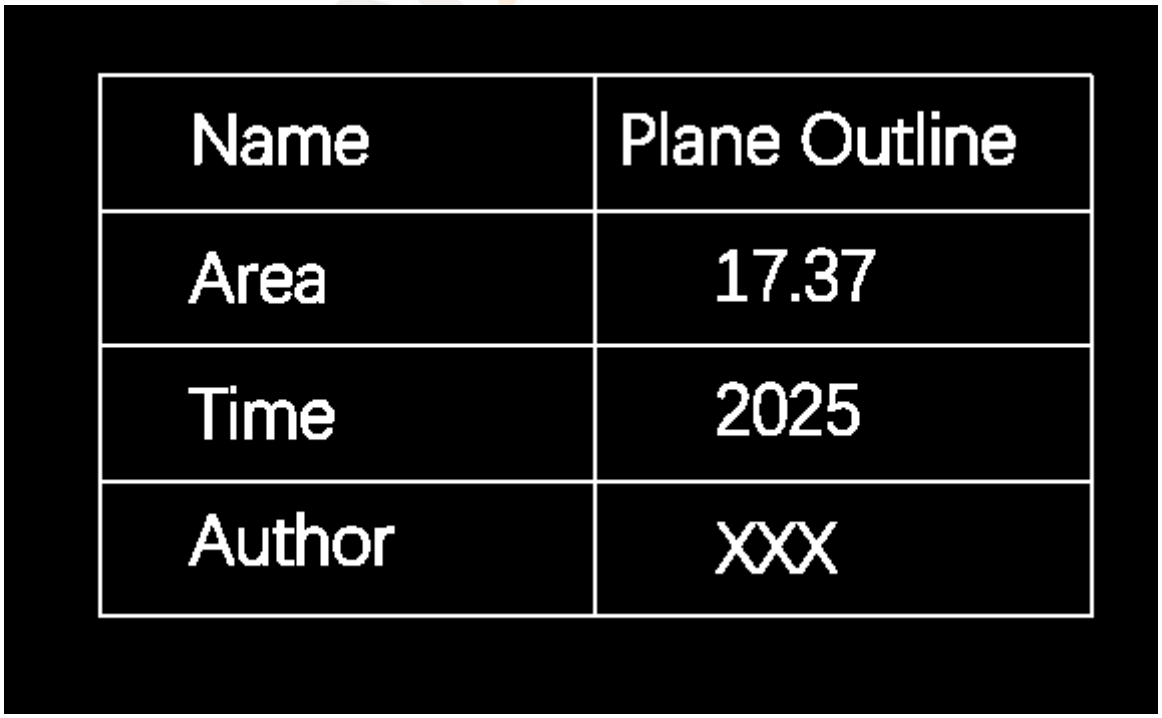


Figure: Fill Table

3.3 Facade Drawing

Facade drawing is generally used to draw facade information of buildings, including different elements such as walls, windows, doors, steps, and annotations.

The data processing flow is as follows:

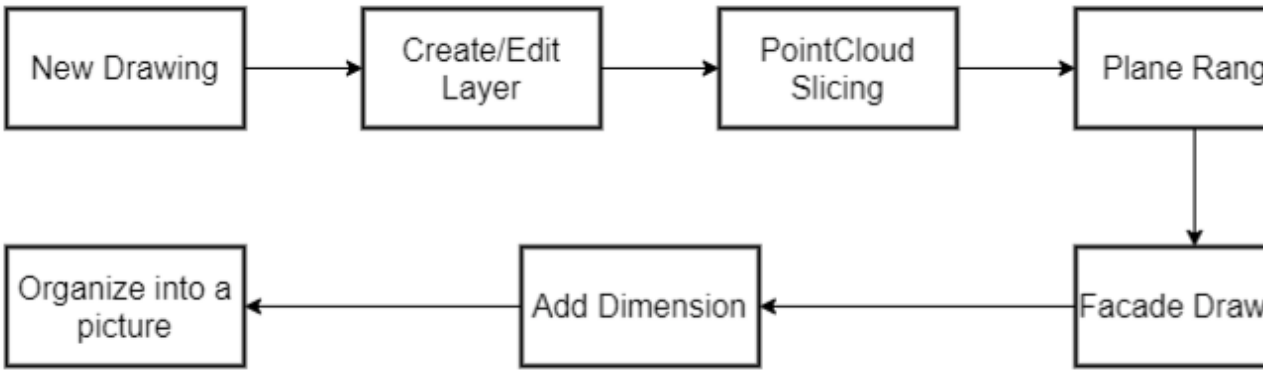


Figure: Facade Drawing Process

3.3.1 New Drawing

Before formally drawing planar elements, it is necessary to create a new drawing. The purpose of creating a new drawing is to store all the elements we draw in this drawing.

Click "New" in the Vector menu bar, select the storage path, name the drawing, and click "Save" to complete the creation.

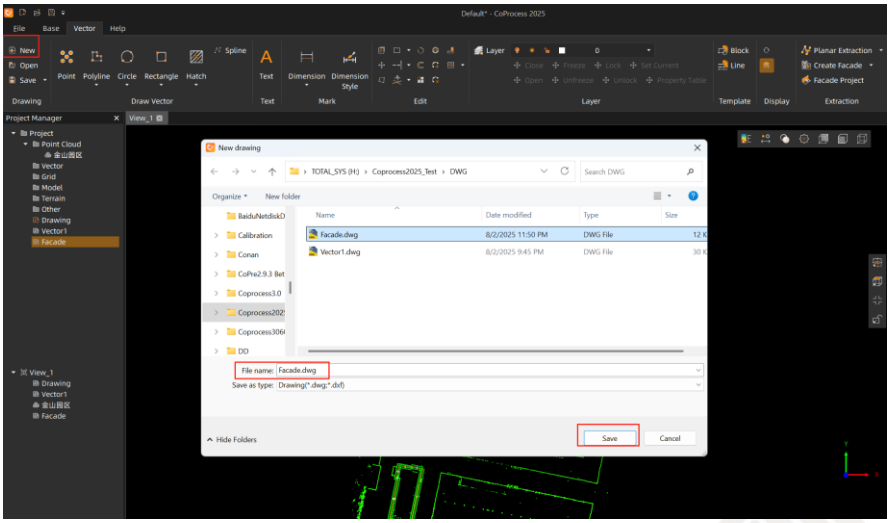


Figure: New Drawing

After creating a new drawing, the new drawing will be displayed in both the Project Manager list and the View □ list. And the icon in front of the name is gray, it needs to be activated.

Activate the drawing. After creating a new drawing, it is necessary to activate the drawing so that the subsequently drawn elements will be saved in the corresponding activated drawing.

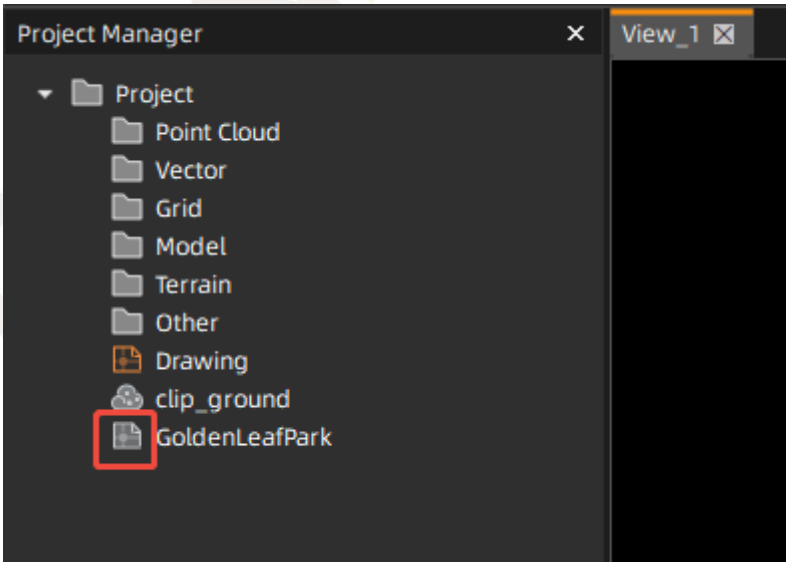


Figure: Drawing-unactived

In the Project Managemer panel, right-click and activate the drawing. At this time, the small icon before the corresponding drawing is highlighted, indicating an activated state.

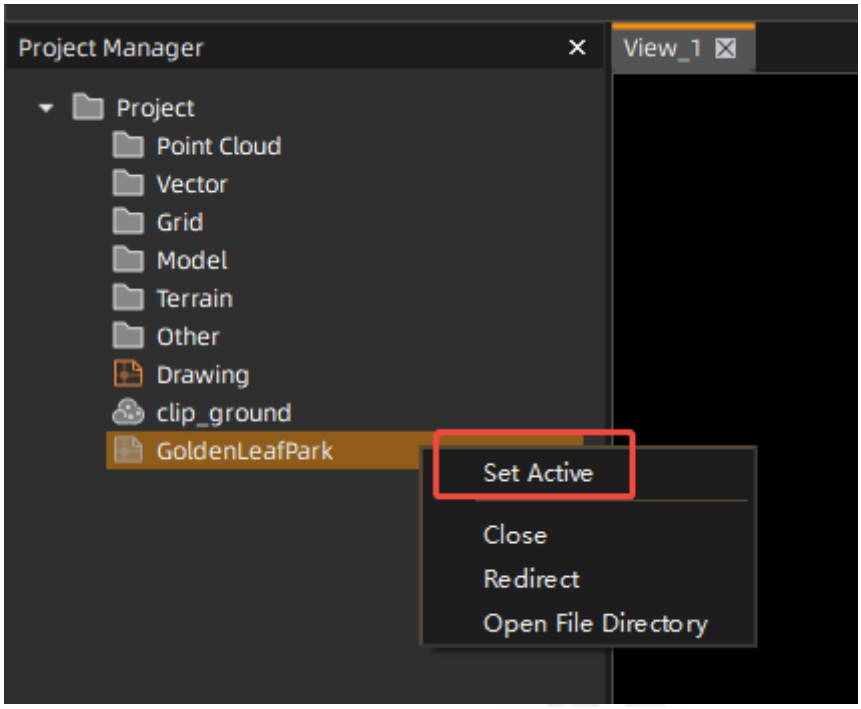


Figure: Set drawing active

3.3.2 Create Layer

After the drawing is created, it is necessary to create different element layers according to the elements to be collected in the current data, such as walls, windows, doors, steps, annotations, etc.

In the Vector menu bar, click the Layer button, and click New Layer in the Layer Manager panel.

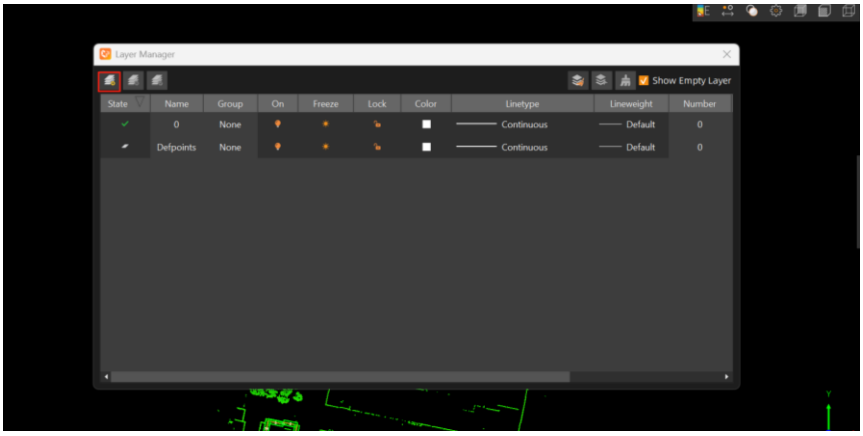


Figure: Create New Layer

After creating a new layer, double-click the layer name to modify it, and click the co lor to modify the layer color to distinguish different elements.

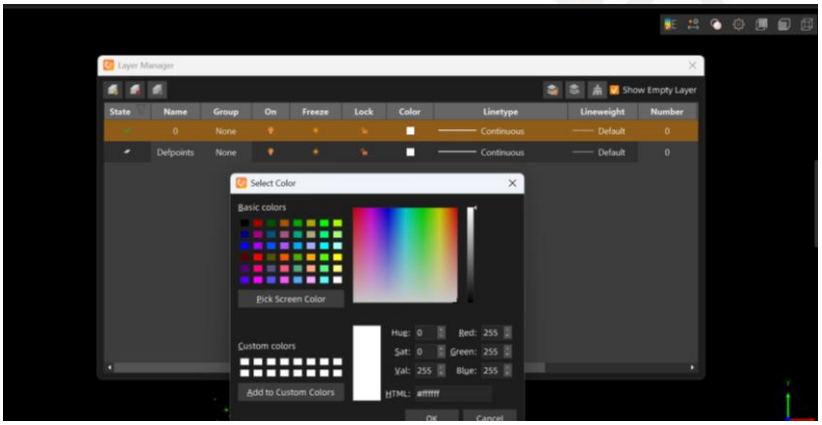


Figure: Modify Layer Color

3.3.3 Point Cloud Slicing

Before formally collecting planar elements, it is necessary to slice the added point clo ud data to better view and reference when drawing planar elements.

In the Base menu bar, click the Horizontal Slice function. The cursor turns into a kni fe shape, indicating that the function is activated. Click the left mouse button on the point cloud data to be horizontally sliced to slice.

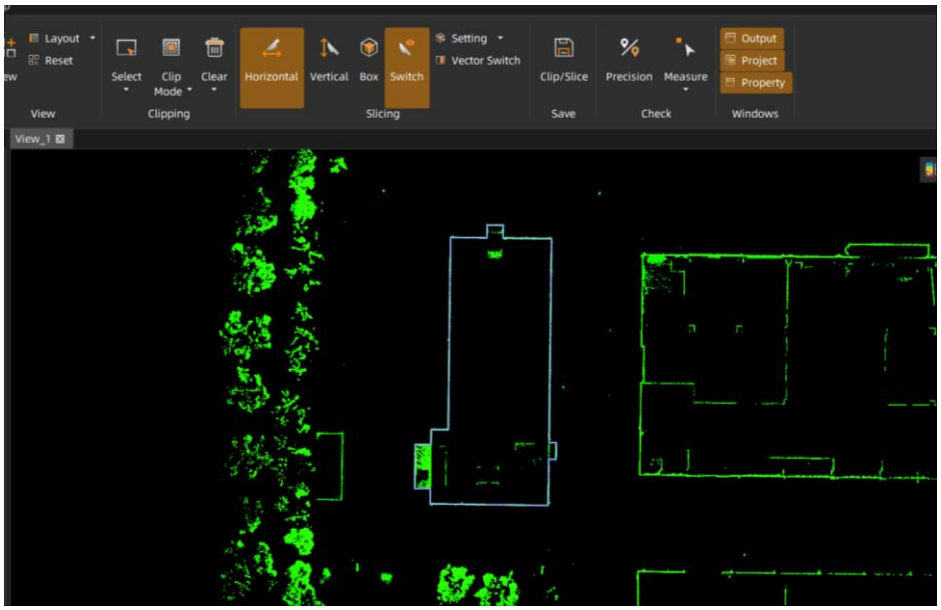


Figure: Horizontal Slice

Slice adjustment: Hold down the "Ctrl" and scroll the wheel to adjust the height of t he slice. Hold down the Shift key and scroll the wheel to adjust the thickness of the slice. Or adjust the maximum and minimum values of the slice and the slice thicknes s in the slice settings panel to adjust the slice.

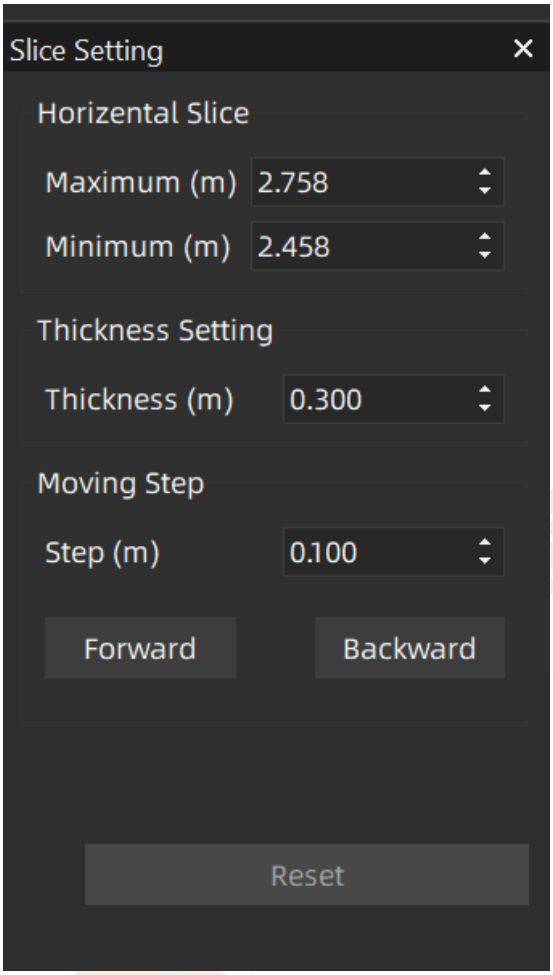


Figure: Slice Setting

The main purpose of slice adjustment is to obtain clear and complete planar contour i nformation, which is convenient for element collection. During collection, the slice can be dynamically adjusted continuously, and the ultimate goal is to facilitate element dr awing.

3.3.4 Planar Range

Before drawing facade elements, it is necessary to draw a planar range first. The soft ware will automatically cut the facade data according to the planar range to facilitate us to draw facade elements.

Select the layer as Plane before drawing.

After horizontal slicing is completed, in the Vector menu bar, click the drop-down but

ton of Polyline and select Right Angle Mode (for regular buildings) to draw the plana r range.

During drawing, you can turn off point cloud snapping in the lower right corner to fa cilitate drawing. Try to draw the planar range line in the center of the slice point clo ud. When drawing surface elements, you can turn on 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 ve ctor as front view

For buildings with regular structures, you can select Four-View; for buildings with co mplex structures, you can select Multi-View.

Click "Ok", and then select a edge of the vector as the front view.

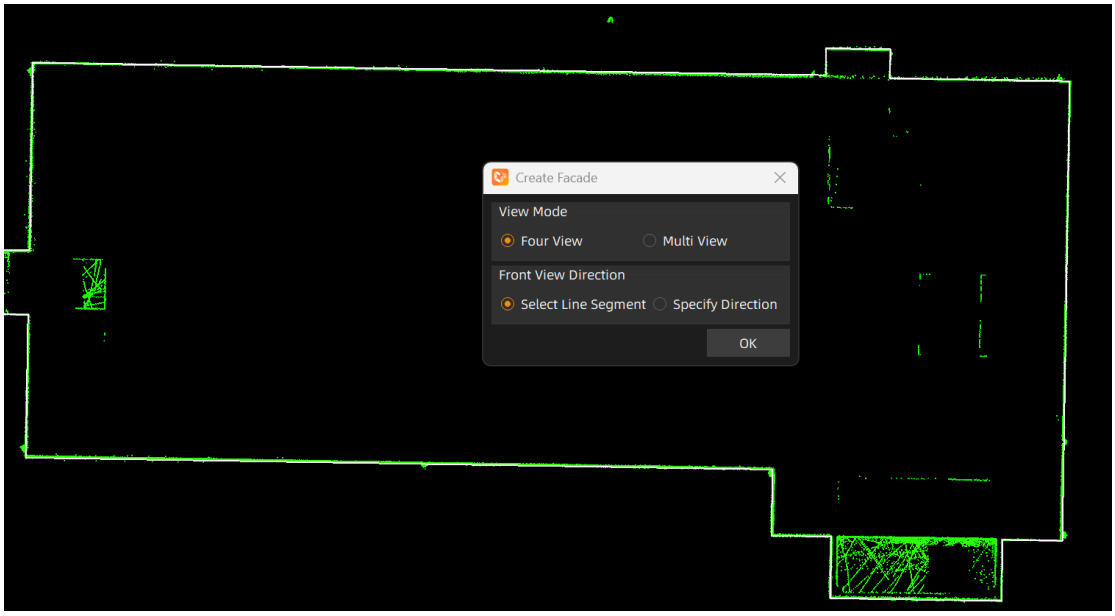


Figure: Right-Angle Mode

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 cutt ing thickness in the facade view to adjust the slice range to ensure that the complete point cloud data is displayed in the facade view.

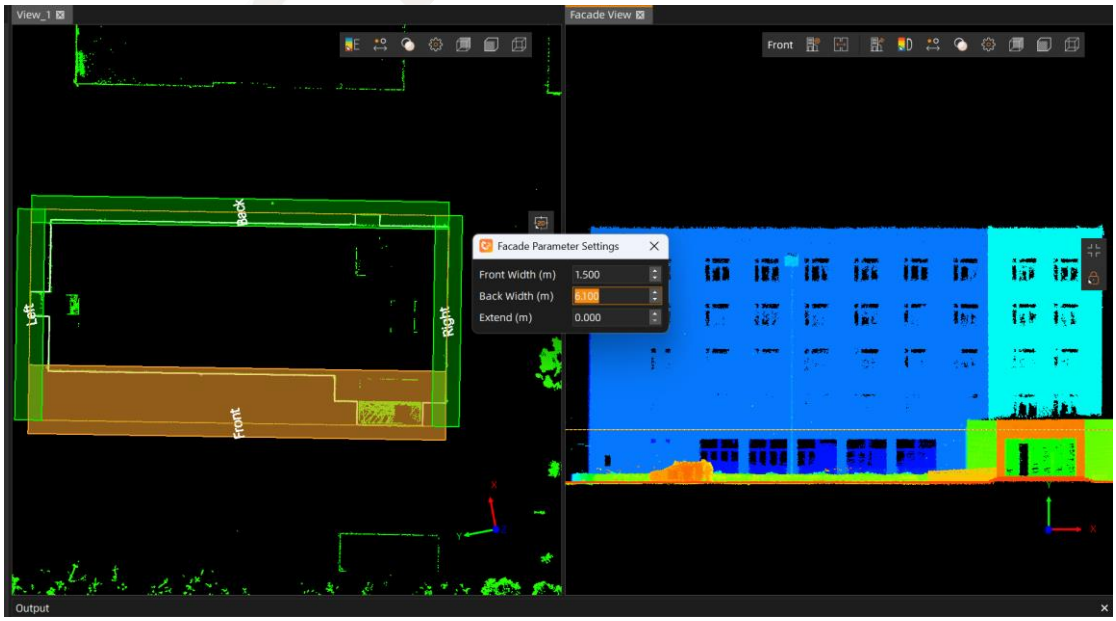


Figure: Four View

After the facade view point cloud slicing is set appropriately, start drawing facade ele

ments.

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 the drawing can start snapping from the endpoint of the planar range.

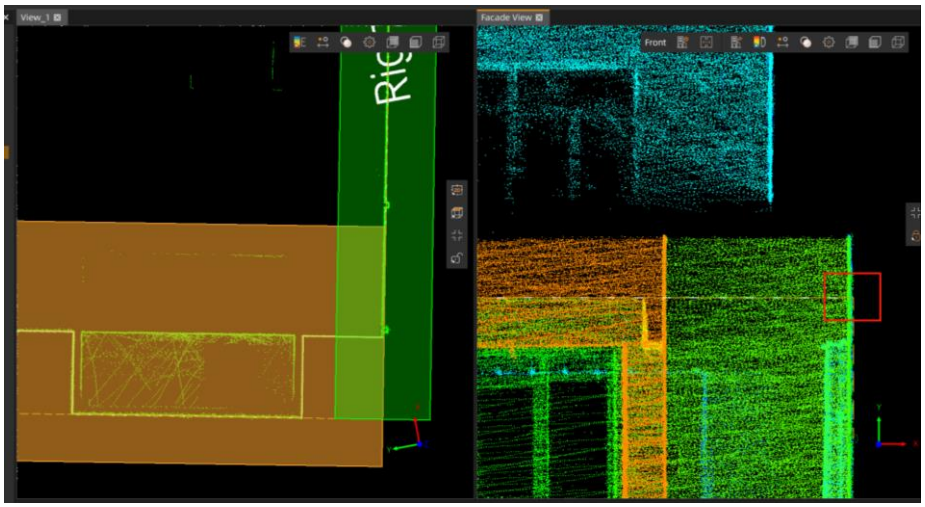


Figure: Facade View

Window drawing: After drawing the wall, you can draw window elements.

In the Vector menu bar, select Rectangle Drawing, and draw rectangles in two-point or three-point mode to represent windows.

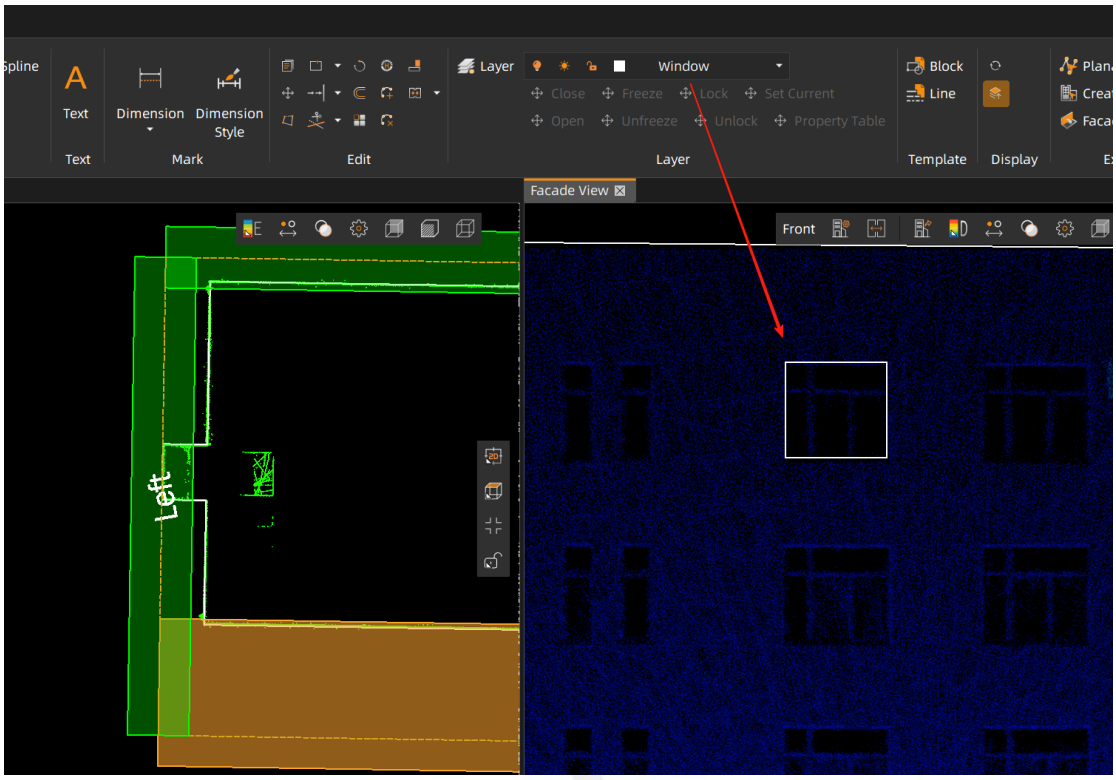


Figure: Set window-layer as current layer

Window array, batch processing: For identical windows, you can use the array functio n to generate other windows in batches.

After drawing one window element, select the current window and click the Array fu nction.

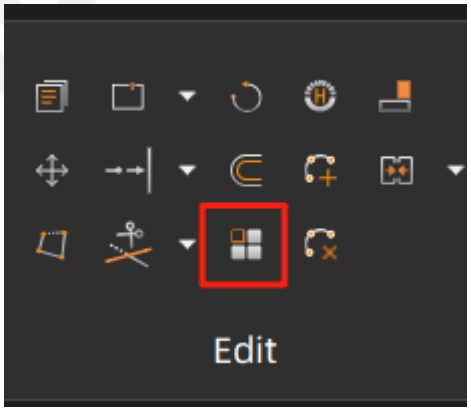


Figure: Window-Array

Modify the row spacing, column spacing, and number of rows and columns in the pa rameter panel.

Modify the row spacing: manually adjust the plus and minus buttons of the row spaci ng to adjust the row spacing until it is in the appropriate position on the graph. Or c lick 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 trans lation.

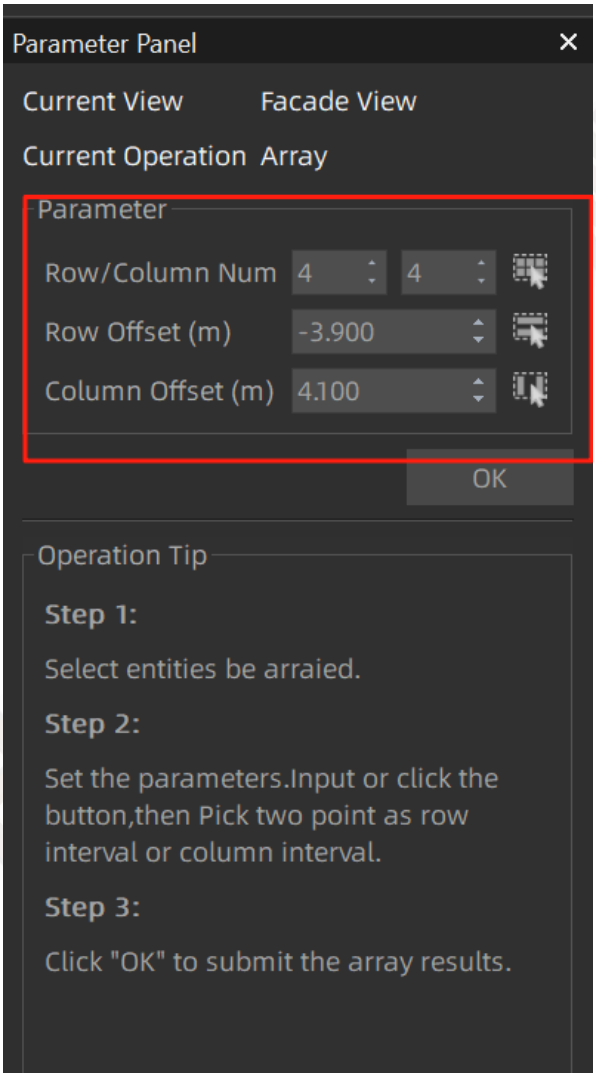


Figure: Set array parameter

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 c olumns 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.

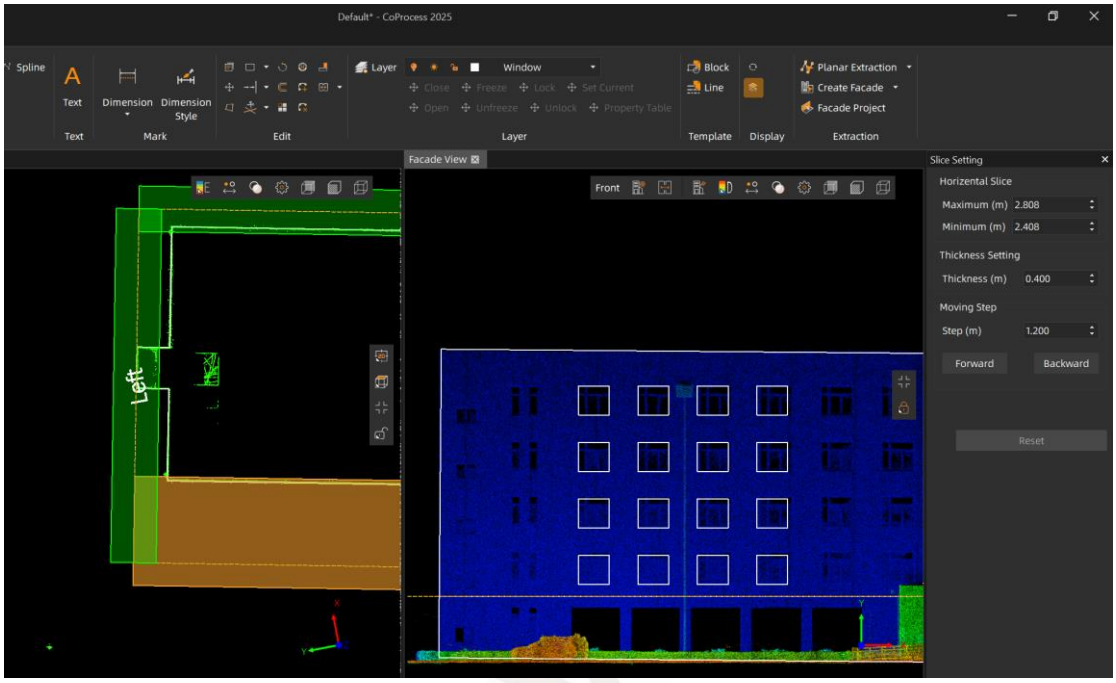


Figure: Set array parameter

Step elements: Switch the layer to Step, and then use Right Angle Mode to start dra wing steps.

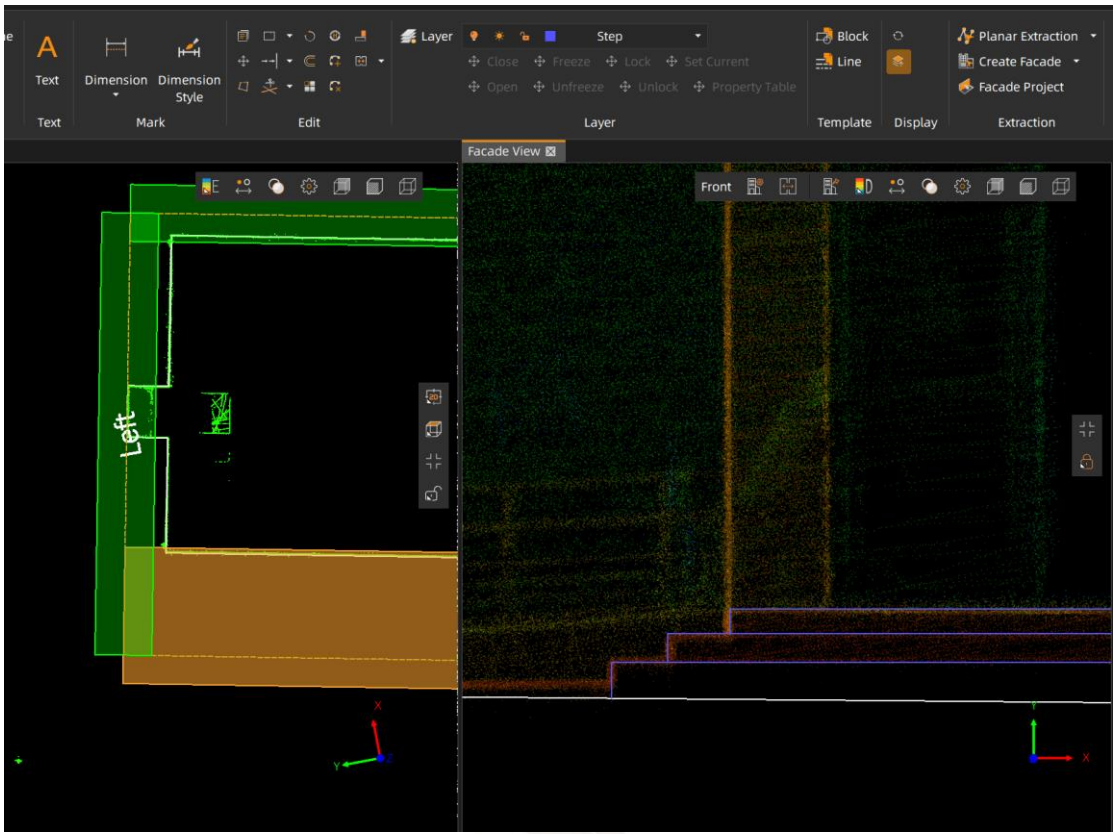


Figure: Right Angle Mode

Door element drawing: Switch the layer to door, and then use Rectangle to start drawing doors.

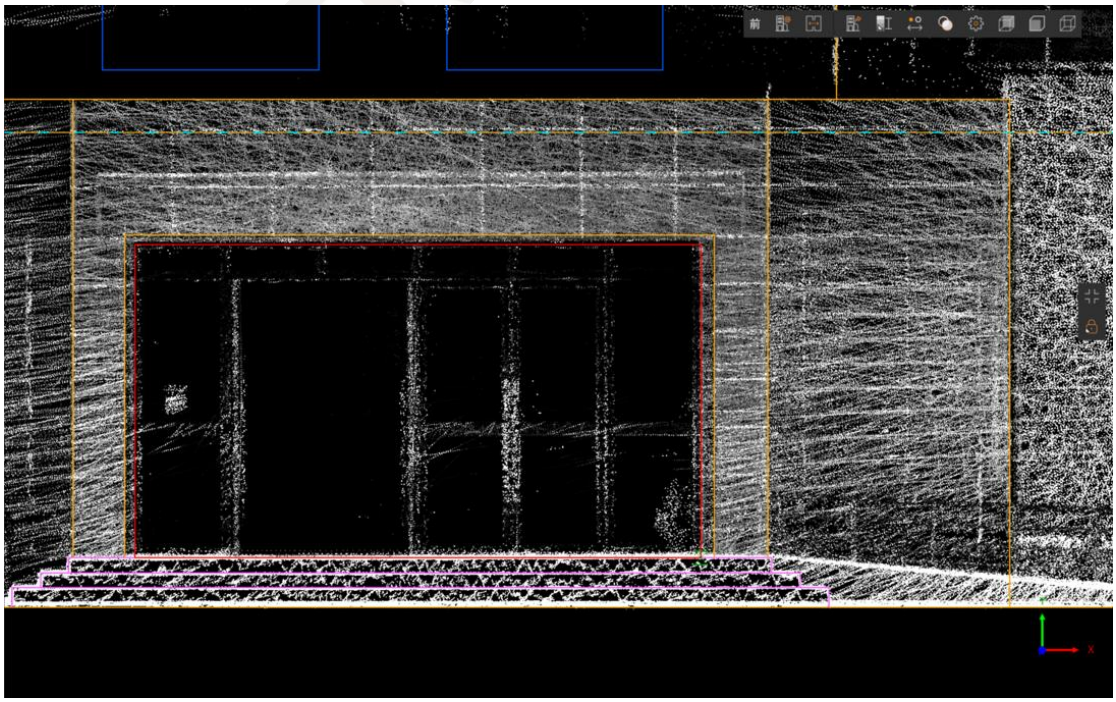


Figure: Drawing door

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.

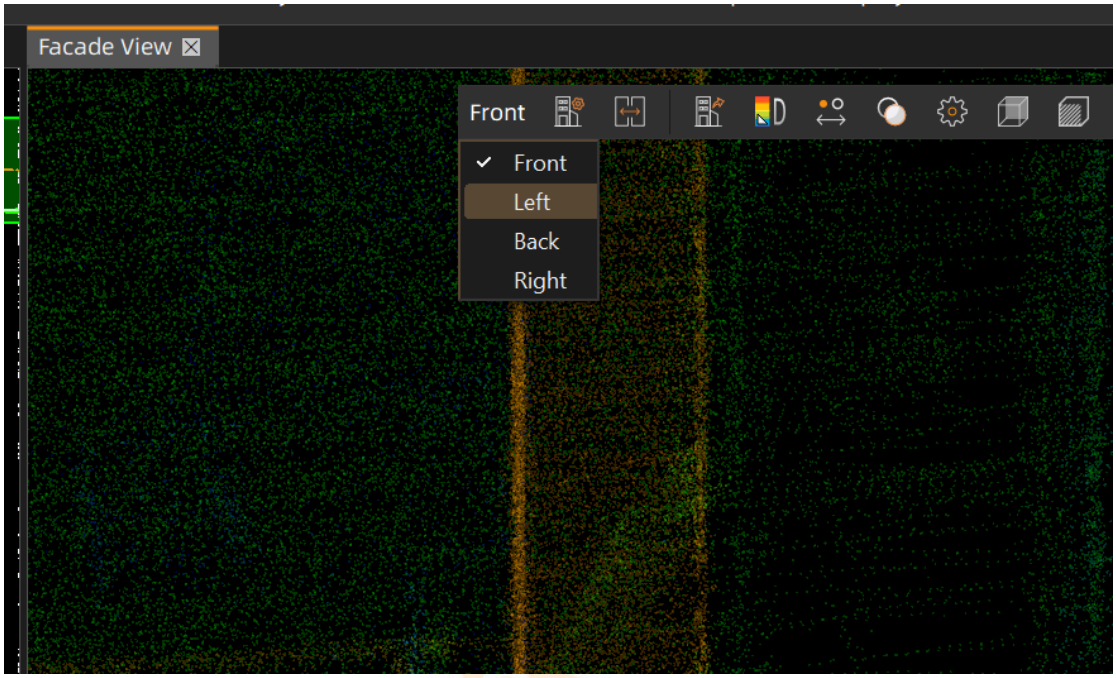


Figure: Choose View

You can also adjust the slice thickness to ensure that the completed point cloud data is displayed in the facade view.

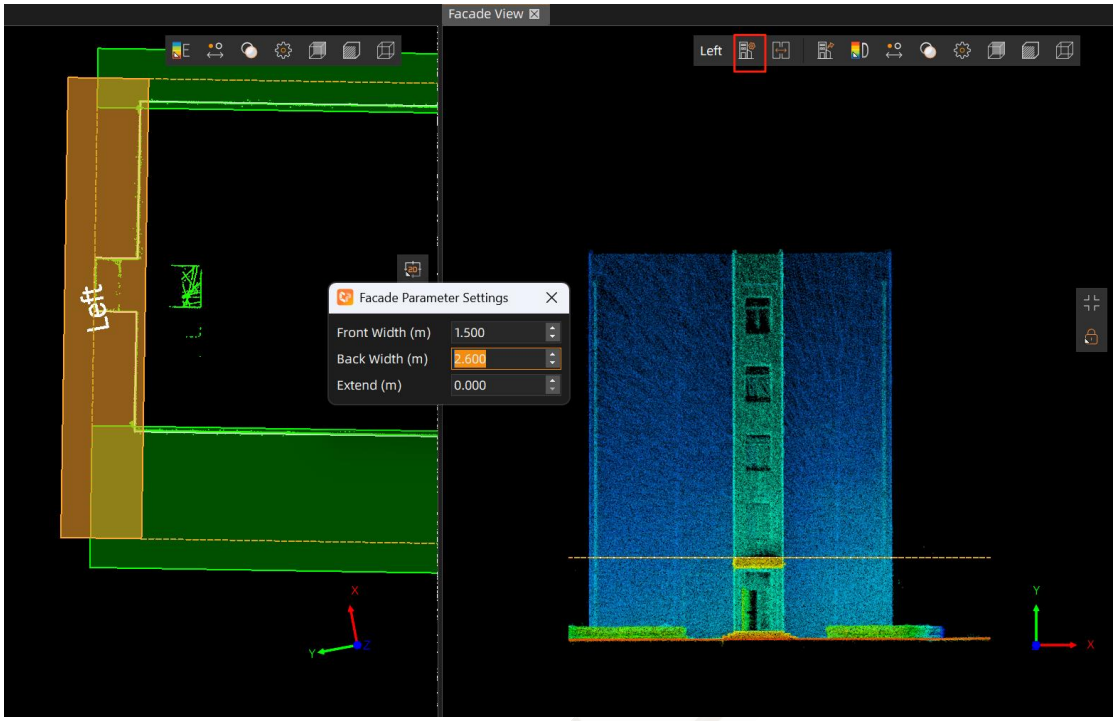


Figure: Set facade-view options

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 consistency.

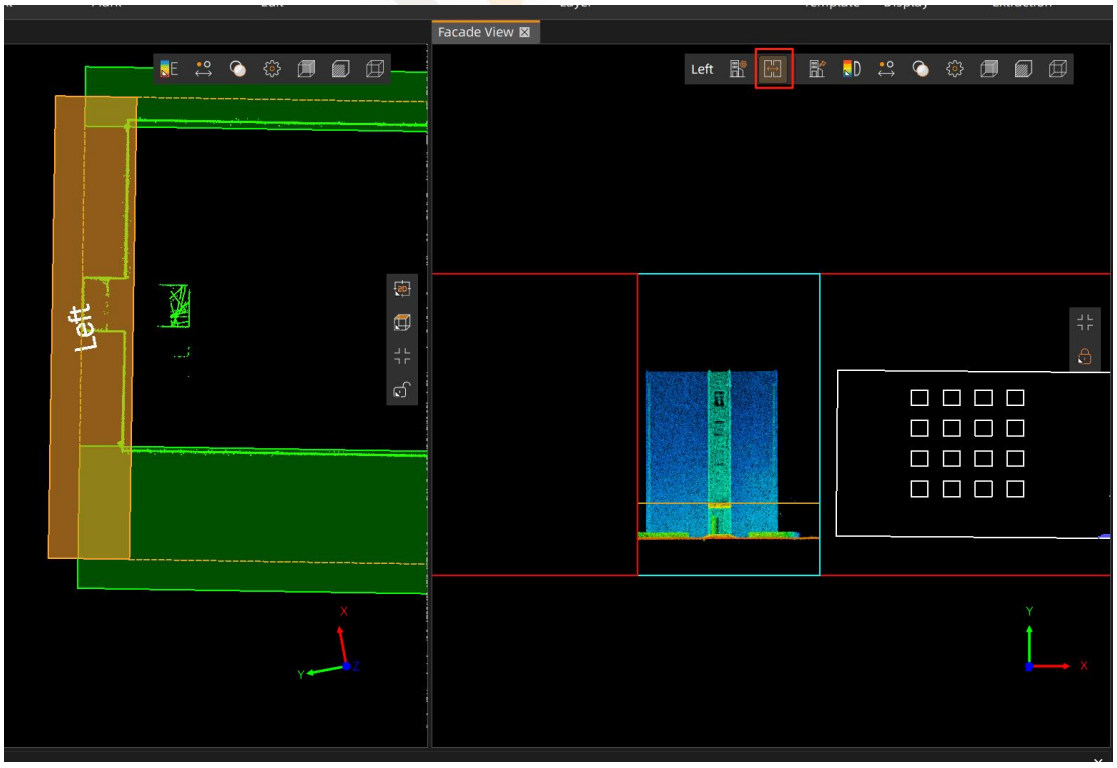


Figure: Facade unfolding

3.6.6 Add Annotation Information

After drawing the facade elements, you can flatten the facade elements to the plane, and then perform operations such as annotation and hatch.

Facade Project: After drawing the facade elements, close the facade view, click the Facade Project function in the menu bar, select the facade proxy line to be flattened, and then select the corresponding position to flatten the facade.

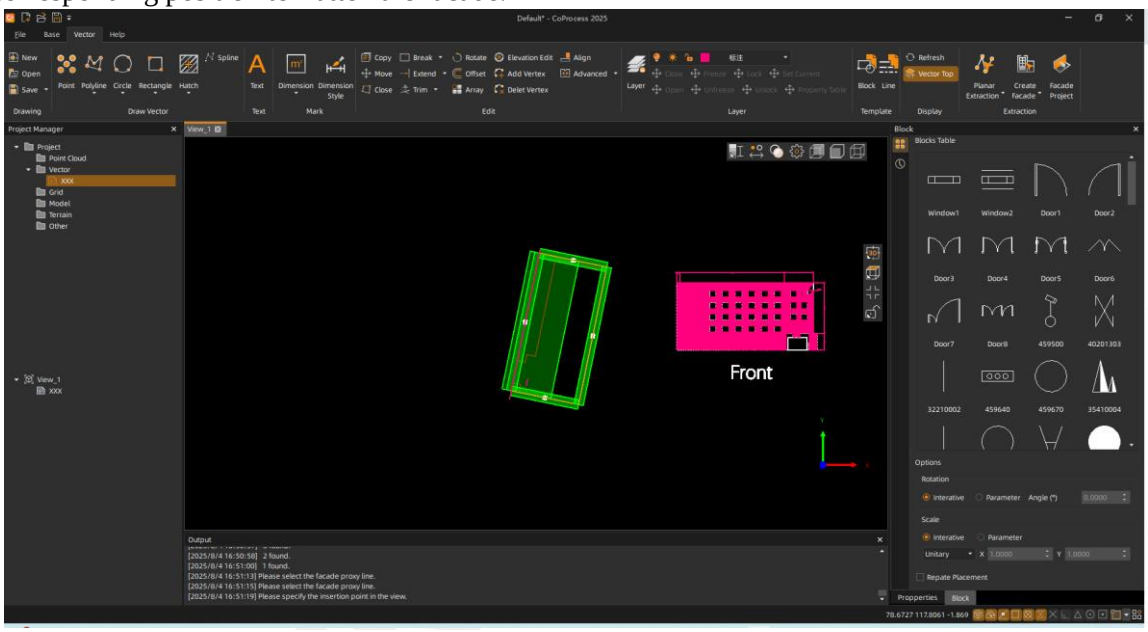


Figure: Facade Flat

Add dimension, which can include aligned dimensions, area dimensions, etc.

Before dimension, you can set the dimension style, including text, unit, precision, etc. Here, set the precision to two decimal places. Click Apply.

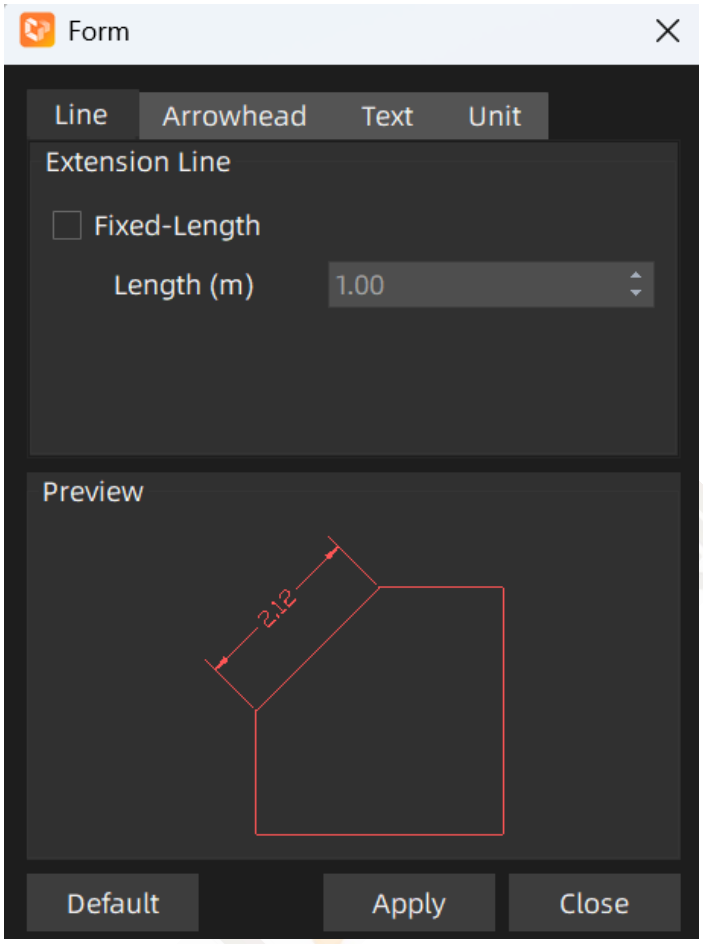


Figure: Dimension Style

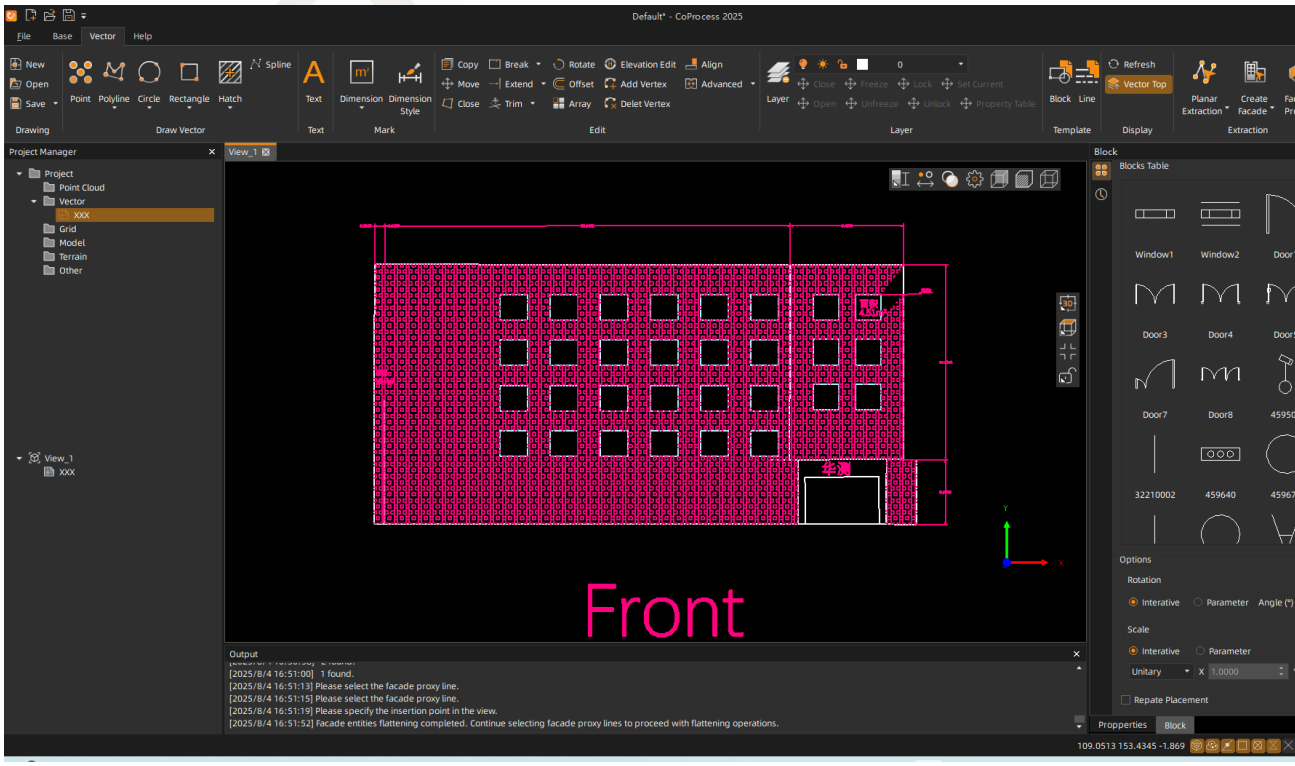


Figure: Drawing Align-Dimension

Aligned dimension: Click the drop-down button of Dimension and select Aligned Dimension to start annotating on the drawn elements.

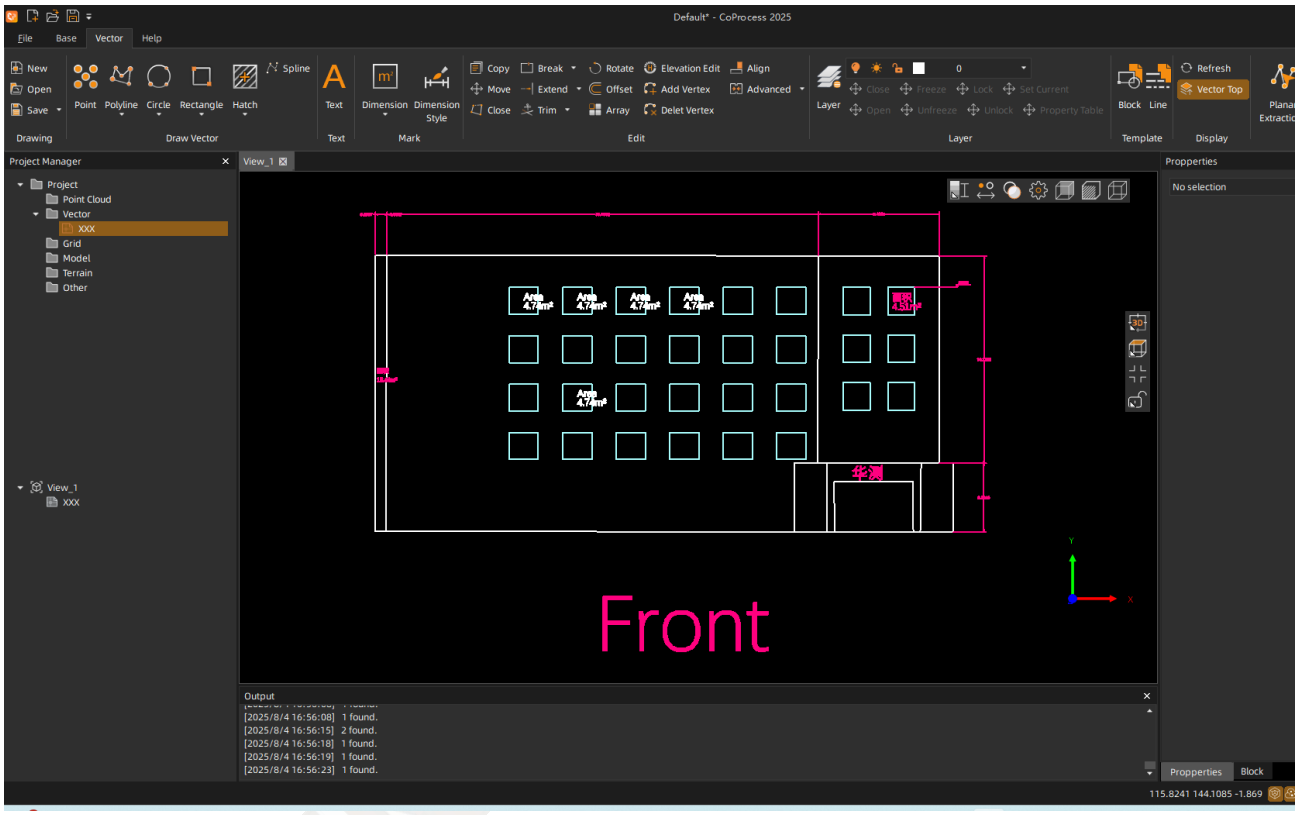


Figure: Drawing Area-Dimension

Area dimension: For a closed 2D area, you can directly select the inside of the closed area to calculate the area. Click directly inside the closed 2D area to perform area dimensioning.

Hatch: For elements such as walls, for easy identification, you can set hatch for the elements. Click the hatch button in the menu bar, select Pick Internal Point, select a hatch style, and click inside the element to be filled to complete the hatch.

If the displayed style is unreasonable after filling, you can adjust the hatch pattern ratio in the property panel until the style is displayed reasonably.

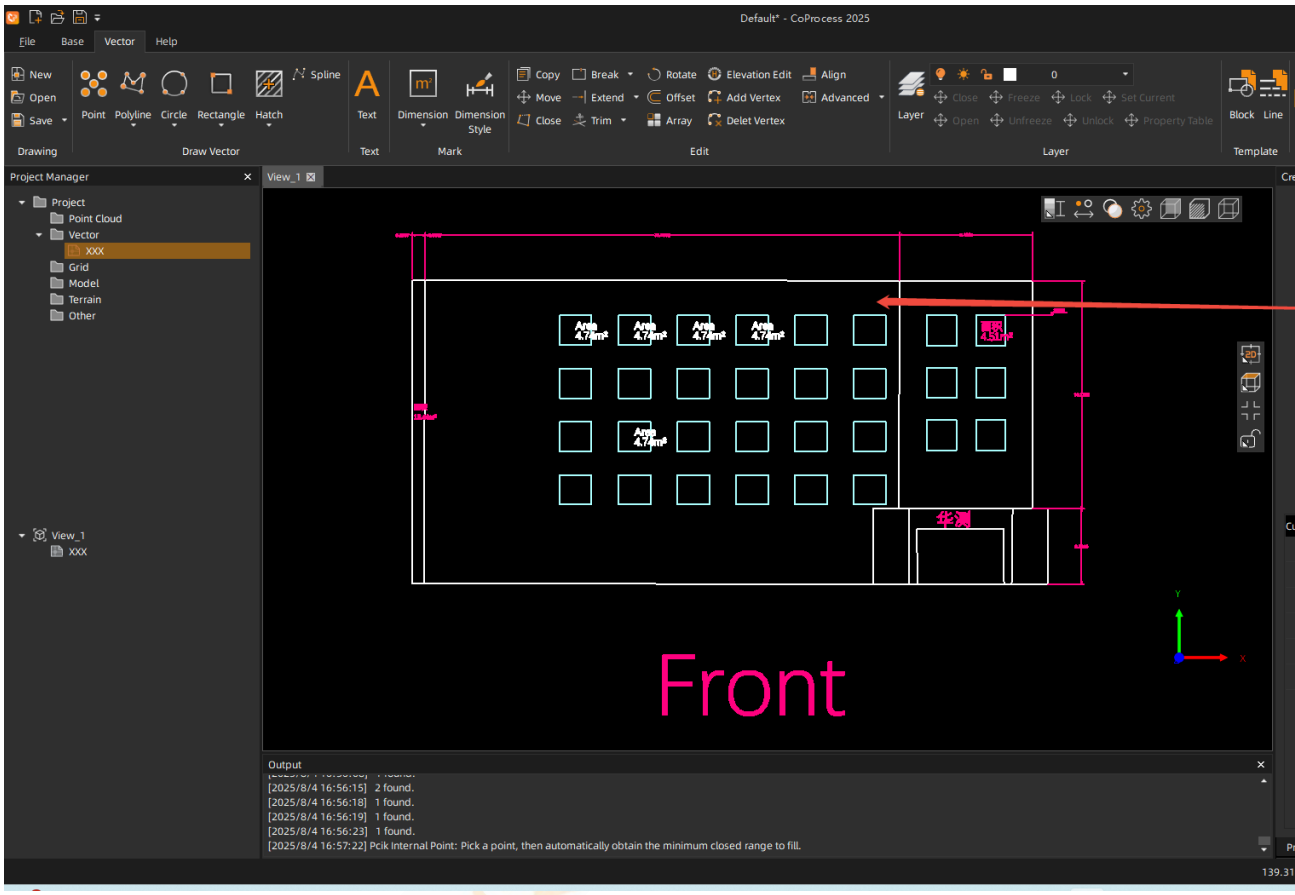


Figure: Facade Flat

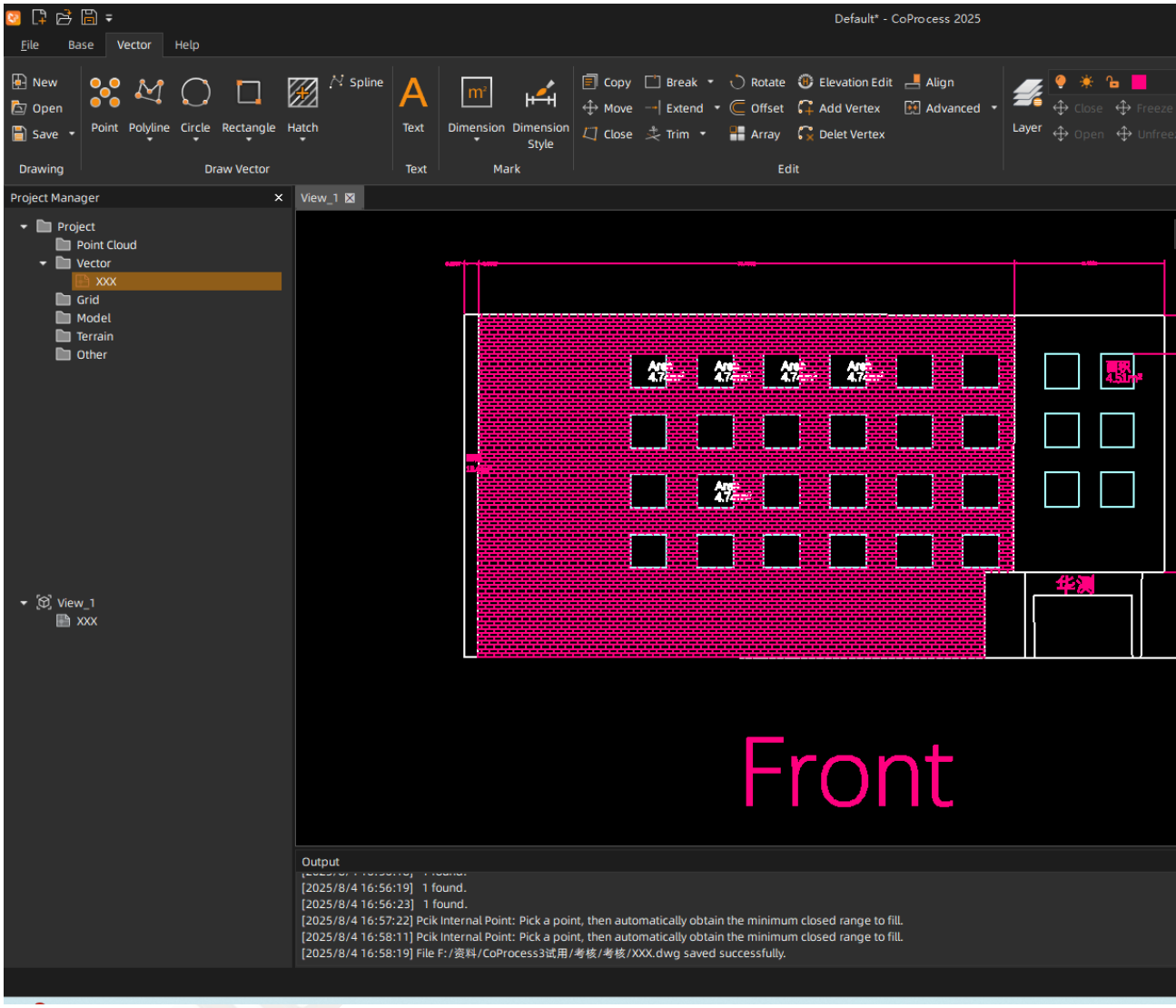


Figure: Drawing fill pattern

3.3.7 Drawing Arrangement

After drawing the elements, it is necessary to arrange the drawing, including the output of tables, files, and the output of the drawing frame.

For table drawing, first draw the number of rows and columns of the table according to the content to be filled in the table. Use line drawing and offset functions in the software to draw the table.

Fill in the table content: Use the Text function to fill in the corresponding information in the table.

Click the Text function, create the starting point, direction, and size of the text in three points, and then enter the text.

Figure: Create Text

Drawing frame: Use the Rectangle drawing function to frame the icon and the drawn vector, then use the Offset function to offset a rectangle to complete the drawing fra me.

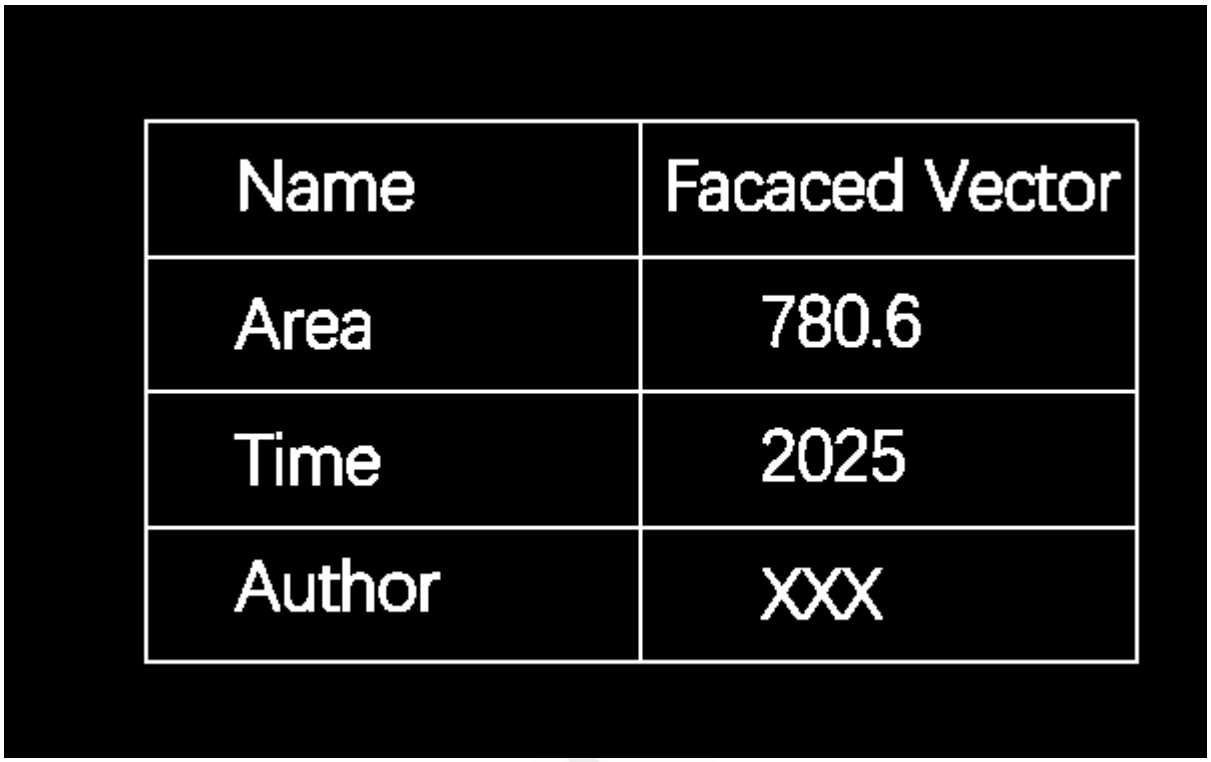


Figure: Fill Table

4.Shortcut Functions and Shortcut Keys

4.1 Platform Shortcut Keys

Shortcut Keys	Shortcut Functions	Remarks
Esc	Exit Current Functions	Used Globally