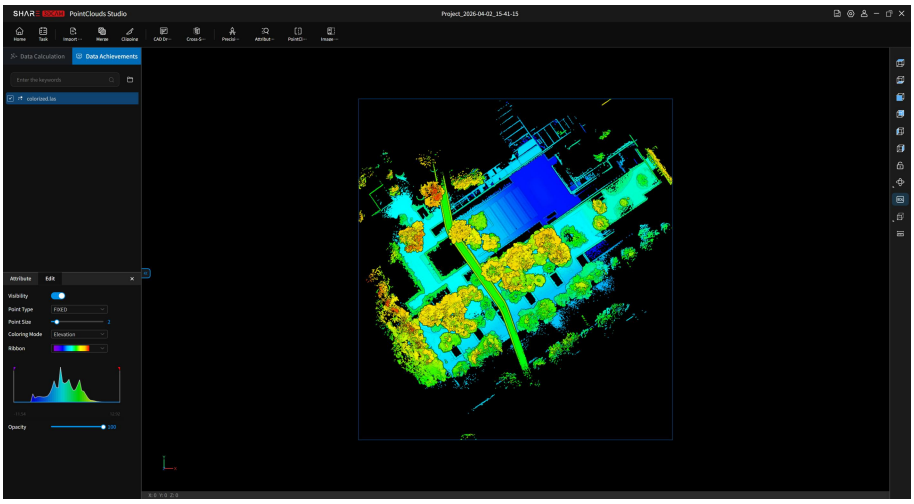
2026.09
Manual Updated to V2.7.0

SHARE PointClouds Studio Instructions



SHARE3DCAM LIMITED

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Chapter 1. Software Overview

1.1. Software Introduction

SHARE PointClouds Studio is an office-side processing tool designed specifically for SHARE handheld 3D laser scanners. The software provides project management, data processing, 3D Gaussian modeling, CAD drafting, data management, and data browsing and analysis. When used with SHARE handheld LiDAR products, it covers the complete workflow from data acquisition through data processing and analysis, fully supporting 3D laser point cloud applications.

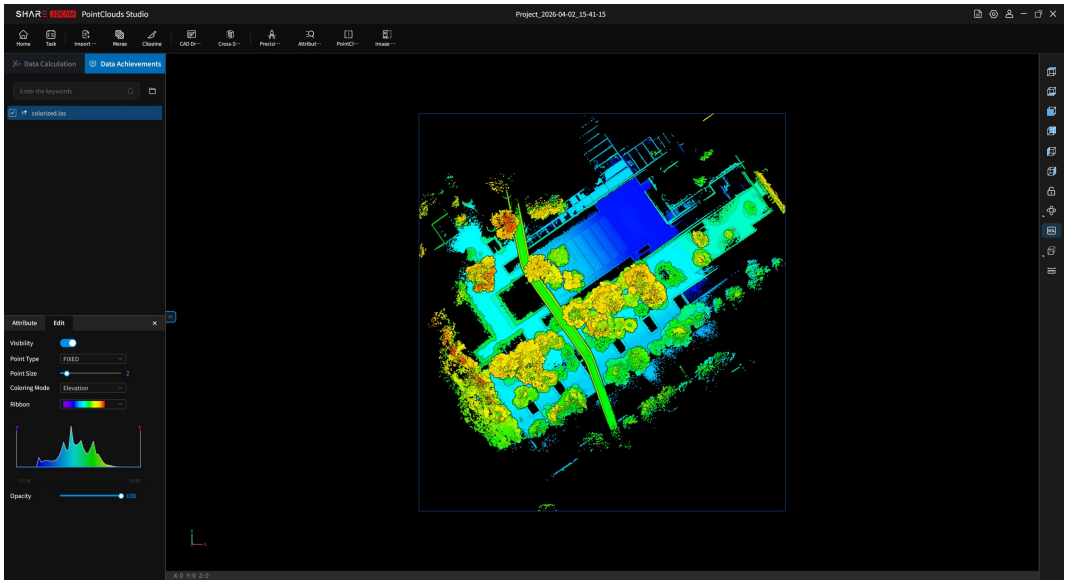


Fig 1-1 Software Interface

1.2. Software Layout

1.2.1. Project Management

After the software starts, it enters the main interface by default (that is, the **Project Management** interface). The functional layout of the main interface is shown below:

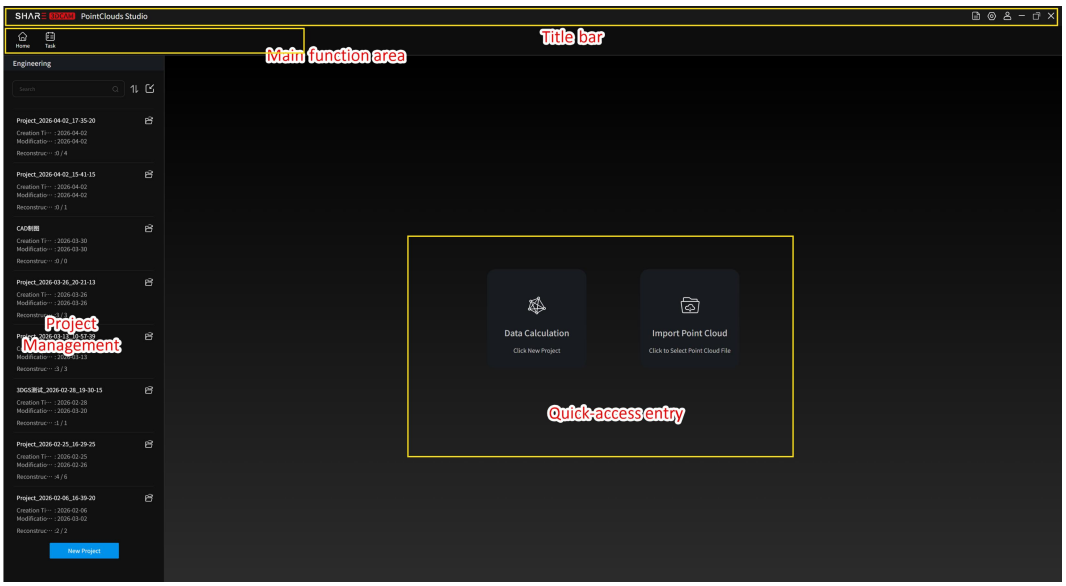


Fig 1-2 Functional Layout of the Main Interface

Title bar: Located at the top of the software. It displays the company logo and software name, and also provides access to the user guide, system settings, user login, and window controls such as minimize, maximize, and close.

Main function area: Located below the title bar. It contains shortcuts to commonly used functions, including returning to the main interface and opening Task Management.

[Project Management] panel: Located on the left side of the software. It displays existing projects and their information, and provides project operations such as creating a new project, importing a project, opening a project, opening the project folder, deleting project, and exporting project.

Quick-access entry: A shortcut for quickly creating a project or quickly browsing data.

1.2.2. Project Browsing Interface

Double-click a project to enter the **Project Browsing** interface. Its functional layout is shown below:

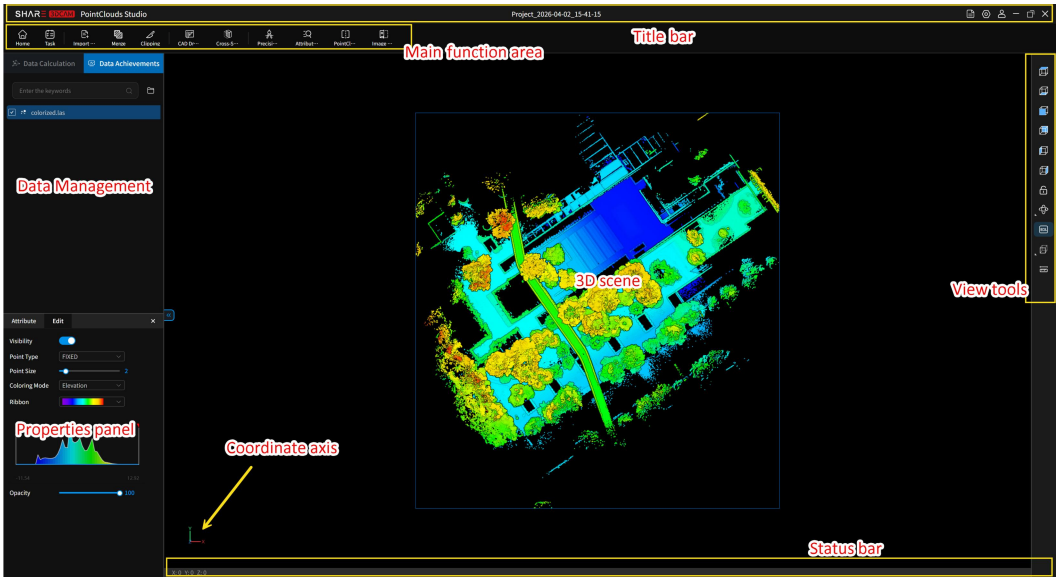


Fig 1-3 Functional Layout of the Project Browsing Interface

Title bar: Located at the top of the software. In addition to the same functions as the title bar on the main interface, it also displays the name of the currently opened project in the center area.

Main function area: Located below the title bar. This is the main access area for software functions. In addition to Return to Main Interface and Task Management, it includes Import Data, Attribute Query, Point Cloud Clipping, CAD Drafting, Accuracy Check, Point Cloud Comparison, and Image Comparison.

[Data Management] panel: Located on the left side of the software. It manages the data in the current project, including raw data and result data.

[Properties] panel: Located on the left side of the software. It displays the property information of point cloud layers, 3D Gaussian layers, measurement layers, vector layers, and other data in the [Data Results] panel, and allows some properties to be modified.

3D scene and Coordinate axis: The 3D data display area supports translation, rotation, zooming, and other operations. The coordinate axis indicates the current orientation of the 3D scene.

View tools: Used to control how data is displayed in the 3D scene, including viewpoint control (top/front/left/back/right/bottom views), locking and unlocking the view, switching view modes, **EDL** effects, transmission-light effects, and switching roaming mode.

Status bar: Located at the bottom of the software. It displays coordinate information and general prompts.

Chapter 2. Software Installation and Licensing

2.1. Hardware and Software Requirements

To ensure the software runs properly, the following configuration is recommended:

Item	Configuration
CPU	Intel® Core™ i7-10700H @ 2.90 GHz (or an AMD processor with equivalent performance)
GPU	NVIDIA RTX 3060 or higher graphics card is recommended. Point cloud mapping requires at least 8 GB of dedicated VRAM, while 3D Gaussian mapping requires at least 12 GB of dedicated VRAM.
Memory	64 GB RAM or above
Storage	At least 100 GB of available disk space
Operating system	Windows 11 64-bit is recommended (some Windows 10 systems may have issues).

2.2. Software Installation, Upgrade, and Uninstallation

2.2.1. Software Installation

1.**Language selection**. After obtaining the installer, double-click it to run. The **Language Selection Window** appears. Select the language you need. The default is **Chinese (Simplified)**, and you may switch to other languages. Click **OK** to enter the installation wizard.



Fig 2-1 Language Selection

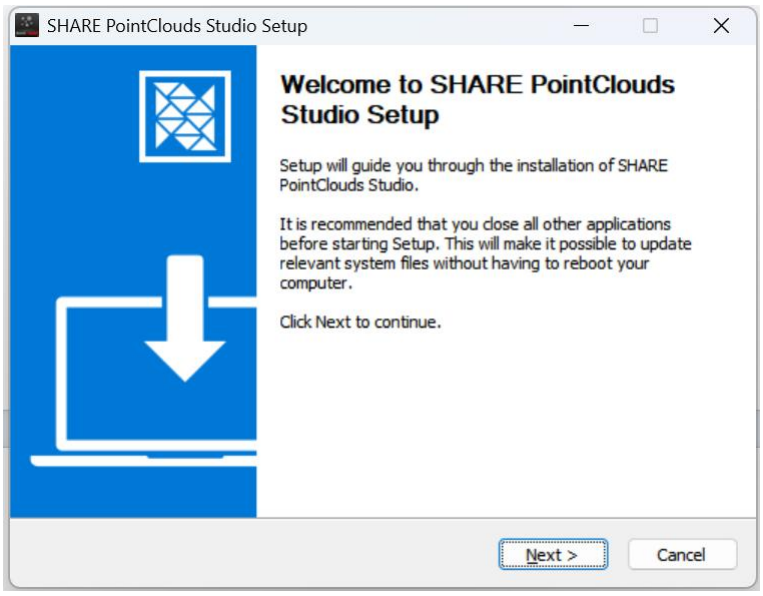


Fig 2-2 Software Installation Interface

2. **Downloading the Python package**. In the installation wizard, click **Next** to enter the Python package download settings page. Click **Preview** to set the download path for the Python package.

Note: Because the Python package is relatively large, please pay attention to network usage and keep the network stable during the download.

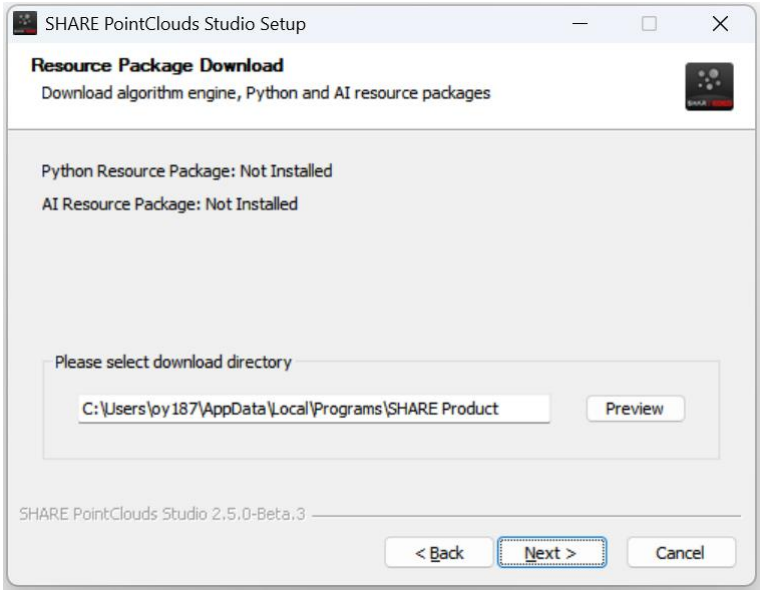


Fig 2-3 Python package Download Interface

Click **Next** to download the Python package. The interface displays the download progress.

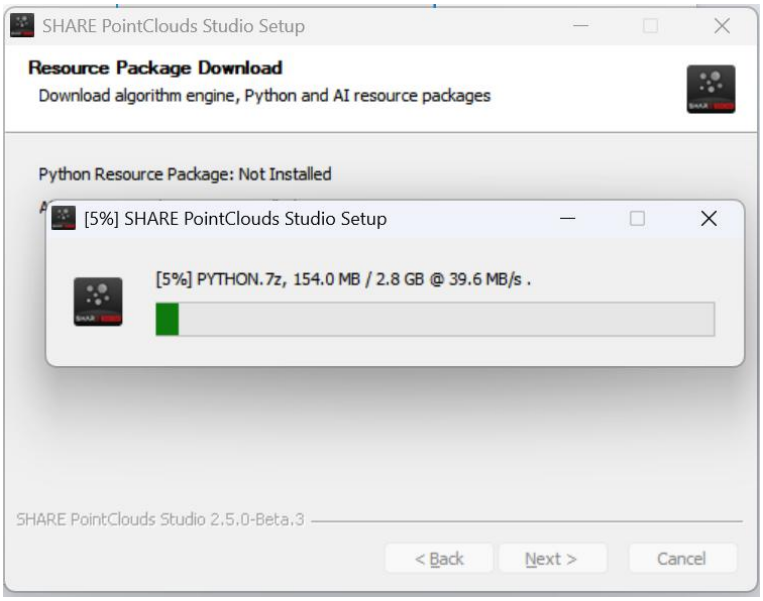


Fig 2-4 Python package Download Progress

After the download is complete, the software installation page appears.

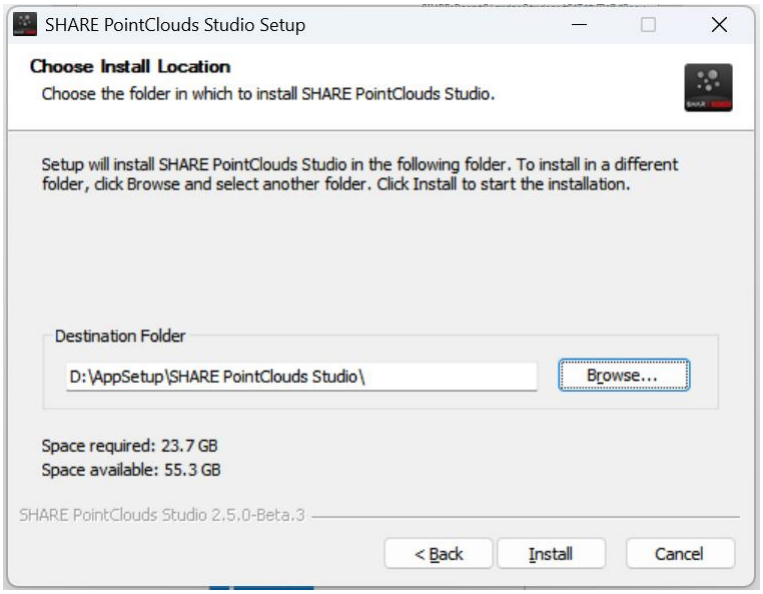


Fig 2-5 Software Installation Interface

3. Installing the software. On the software installation page, you can choose the installation path. Click Install to begin installation, and the interface will display the installation progress.

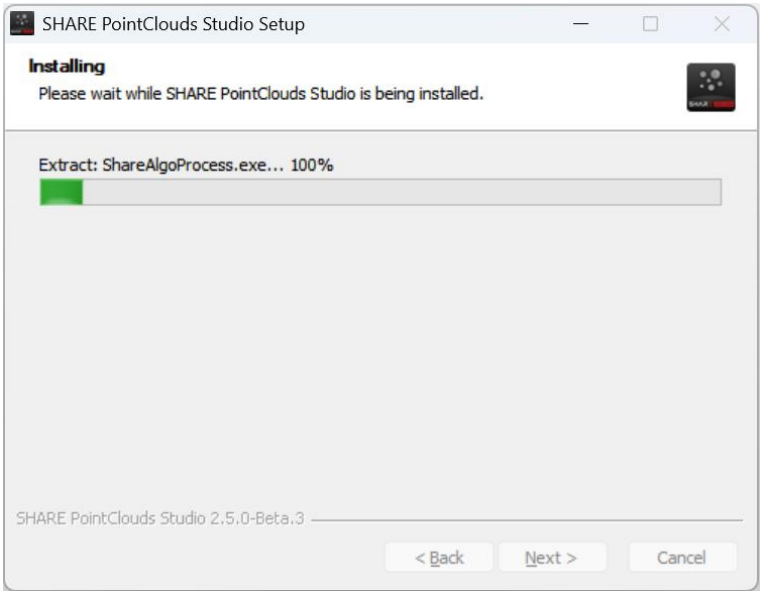


Fig 2-6 Software Installation Process

After installation is complete, a prompt appears asking whether to run **SHARE PointClouds Studio**. This option is selected by default and may be cleared. Click **Finish** to complete the installation.

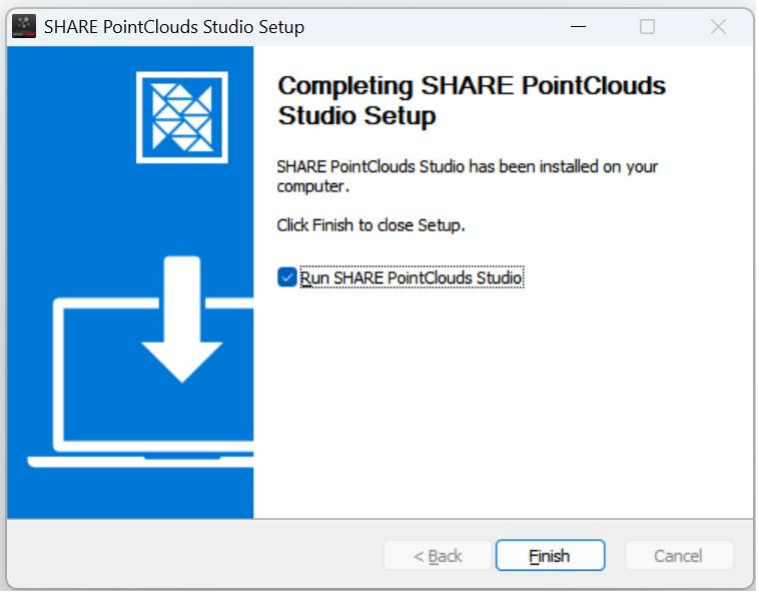


Fig 2-7 Installation Completed

Note: You may also install the software using the full installation package in ISO format. This method skips the Python package download step. All other steps are the same.

2.2.2. Upgrades and Updates

2.2.2.1. Software Upgrade and Update

When a new software version is available, a pop-up window appears when you open the software. Click **Update** to download the latest installation package.

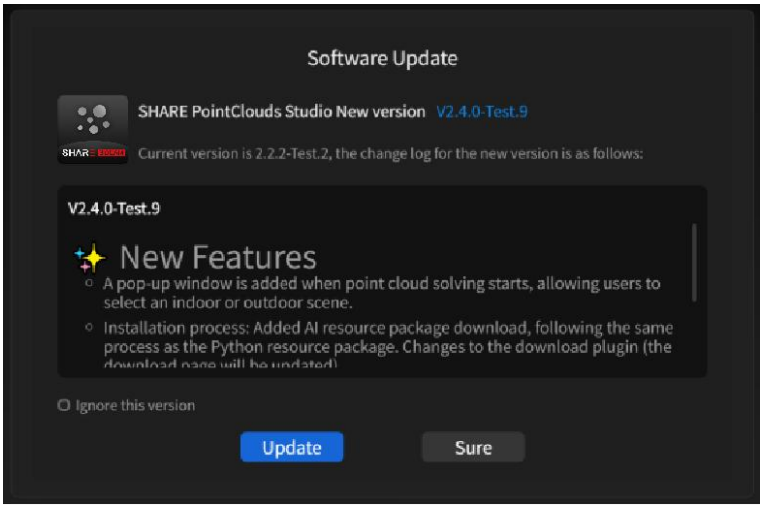


Fig 2-8 Application Update Pop-up

After the download is complete, click **Exit Application and Install Update** to perform the software upgrade.

Before updating, save the current project and stop any processing tasks in progress. During download, you can stop, retry, or resume the download. If the network is interrupted, unfinished downloads can be resumed.



Fig 2-9 Install Update

Note: Update notifications depend on network connectivity. To receive notifications for new software versions, please keep your computer connected to the network.

2.2.2.2. Algorithm Engine (SAE) Update

The software's algorithm engine module (**SAE**) can be updated independently. When a new engine version is available, click **Update** to download and install the latest algorithm engine.

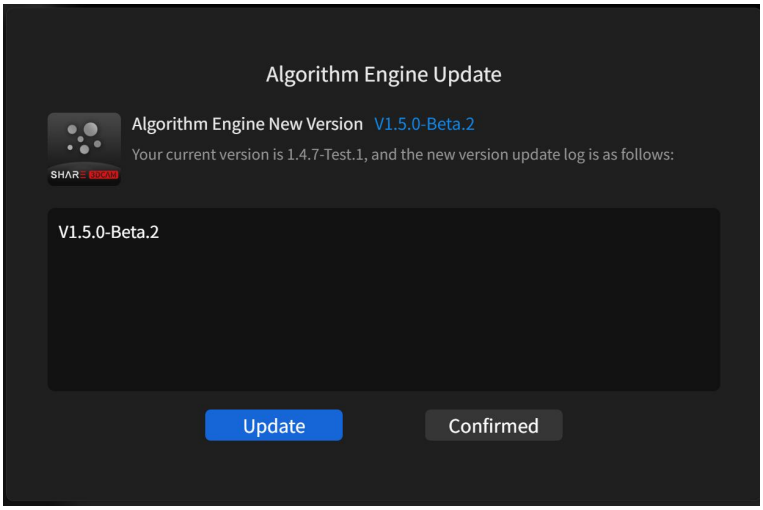


Fig 2-10 Algorithm Engine Update

Note: Algorithm engine update notifications depend on network connectivity. To receive update notifications, please keep your computer connected to the network.

2.2.2.3. Check Updates

Click **System Settings** to view the versions of the algorithm engine, Python environment, and the software itself. Click **Check Updates** to see whether any components are pending update.

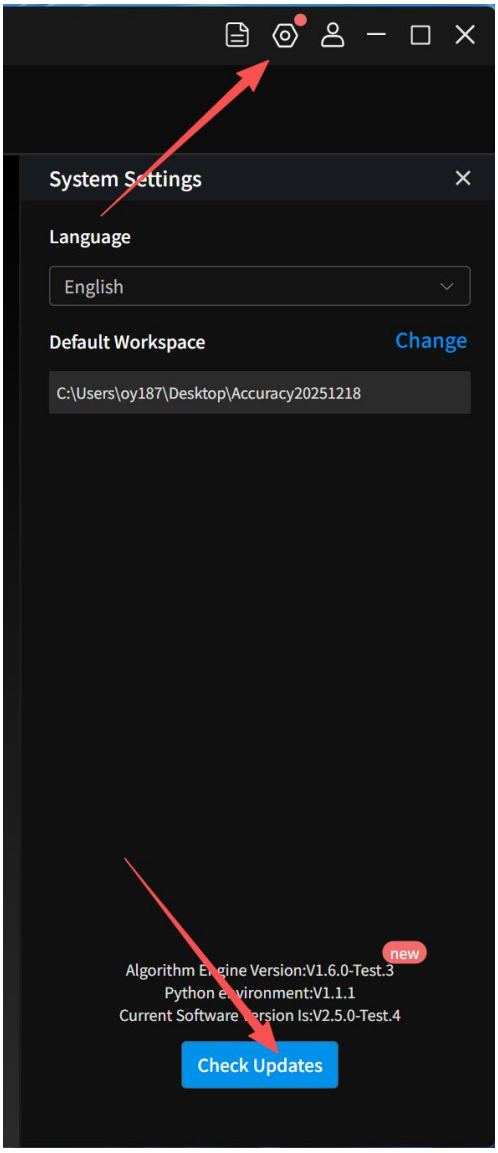


Fig 2-11 Check for Updates

2.2.2.4. Gray Version Update

When a gray-release client clicks "Check for Updates" and a gray test version exists, a "Beta Version Update" prompt appears (test version — update with caution): click "Update" to download the gray version; click "Ignore" to stop prompting for the current gray version (normal update prompts resume once it becomes an official version). After a gray version stops being published, the software prompts you to roll back to the official version; rolling back does not delete local project data.

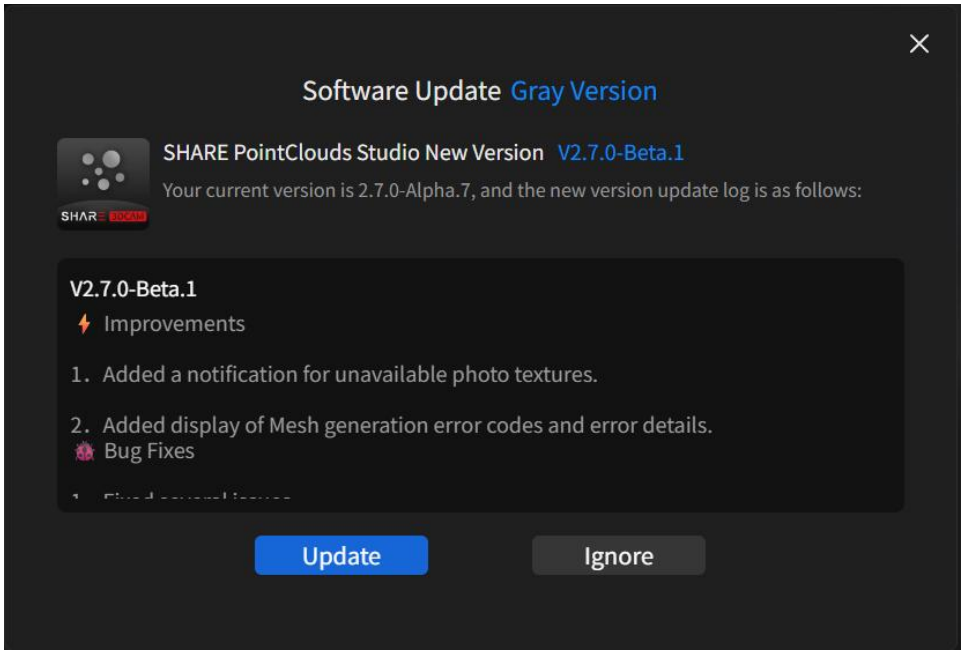


Fig 2-12 Gray Version Update Prompt

2.2.3. Software Uninstallation

Open the directory where the software installer is located in Windows Explorer, then double-click **Uninstall SHARE PointClouds Studio.exe** to uninstall the software.

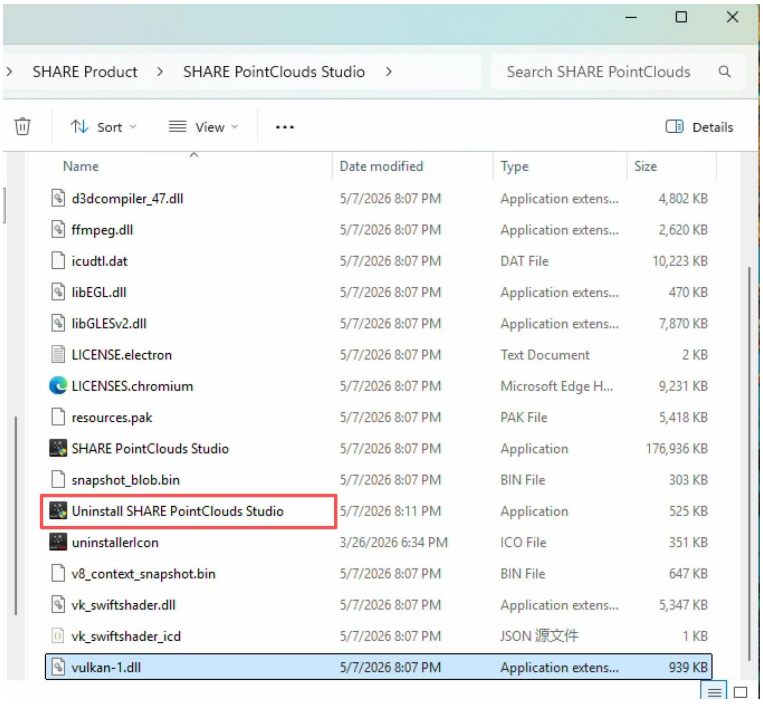


Fig 2-13 Software Uninstaller

In the uninstallation window that appears, you may choose whether to delete user data. By default, user data is not deleted.

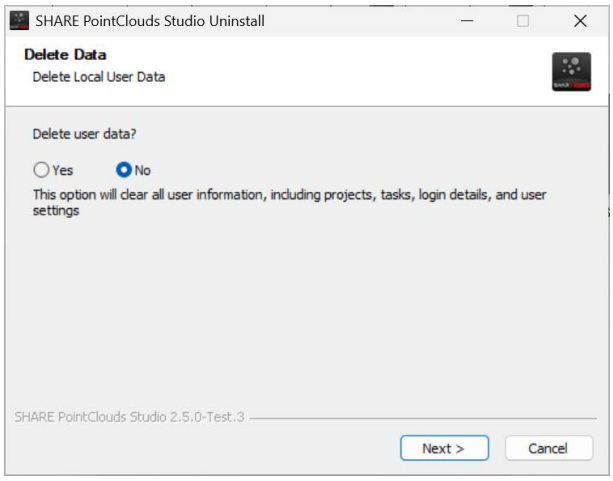


Fig 2-14 Confirm Deletion of Data

Click **Next**, then click **Uninstall** to start the uninstallation process.

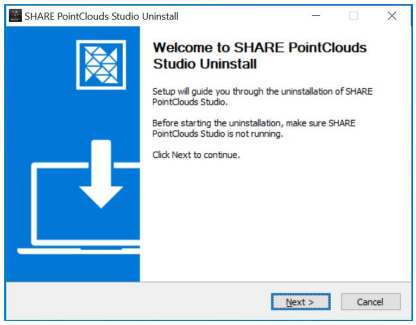


Fig 2-15 Software Uninstallation Interface

2.3. Software Licensing (S10 Only)

Note: Only reconstruction of data collected by a SHARE SLAM S10 device requires software licensing.

The software uses a hardware lock for licensing. Before licensing, prepare the hardware dongle and install the encryption driver.

2.3.1. Obtaining the Hardware Dongle

When you purchase a **SHARE SLAM S10**, a hardware dongle is usually included. If it is not included, please contact **SHARE** official technical supporter.

2.3.2. Installing the Encryption Driver

The encryption driver is installed together with the software. After installation, you can find it in the **Windows hidden icons** area.

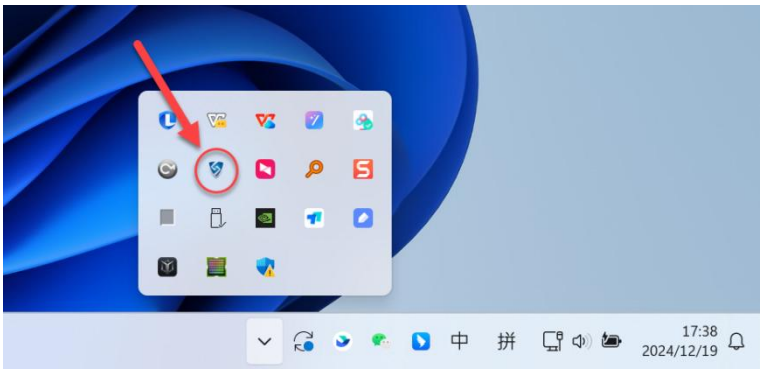


Fig 2-16 Encryption Driver

2.3.3. Software Licensing

Insert the hardware dongle into the computer and open the **Virbox User Tool** interface. In **[Hardware Lock] - Local Encrypted Lock**, you can view the software license information. If the interface appears as shown below, the license has been activated successfully.

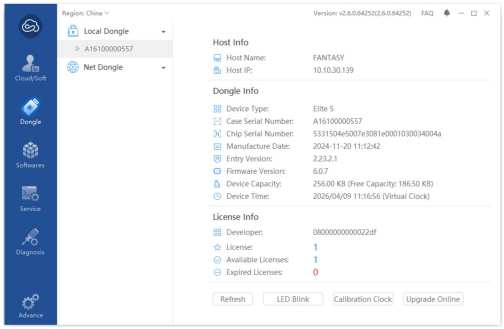


Fig 2-17 Successful Licensing Interface

Chapter 3. Data Processing Workflow

Using data collected by **SHARE SLAM S20** as an example, the data processing workflow includes 3 steps: copying raw data, reconstructing the point cloud, and viewing & analyzing the data, as described below.

Common tasks can be completed quickly using the following workflows:

Point cloud reconstruction: Create a project -> add raw data -> configure parameters -> start processing -> view or export the point cloud.

CAD drafting: Open a point cloud -> generate a section or plan -> edit and draw -> save vectors -> export a DXF drawing.

3DGS reconstruction: Confirm that undistorted photos are output -> configure 3DGS parameters -> start processing -> view the model.

For GNSS fusion, control-point calibration, point cloud registration, or coordinate transformation, first confirm that the raw data is complete and verify the coordinate-system and control-point information.

3.1. Copying Raw Data

After **SHARE SLAM S20** finishes data acquisition, remove the **TF card** from the device, insert it into the supplied card reader, and then connect the card reader to the computer.

After the computer recognizes the **TF card**, copy the raw project data to be processed to a local folder on the computer.

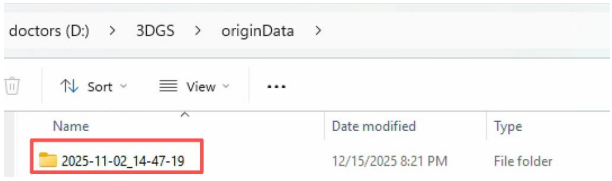


Fig 3-1 Copying Raw Project Data

3.2. Point Cloud Reconstruction

On the main software interface, click **New Project** at the bottom of the **[Project Management]** panel. The **New Project** dialog box appears.

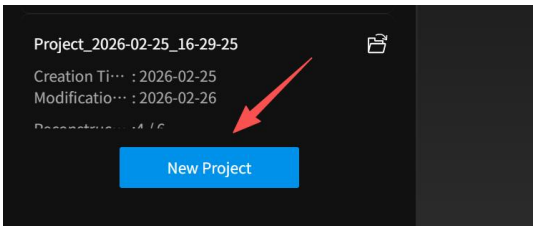


Fig 3-2 New Project Button

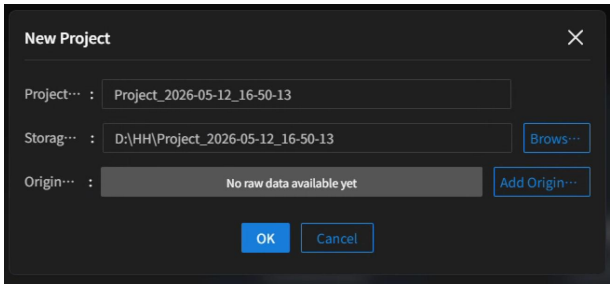


Fig 3-3 New Project Dialog Box

Click **OK** to enter the **Project Browsing** interface.

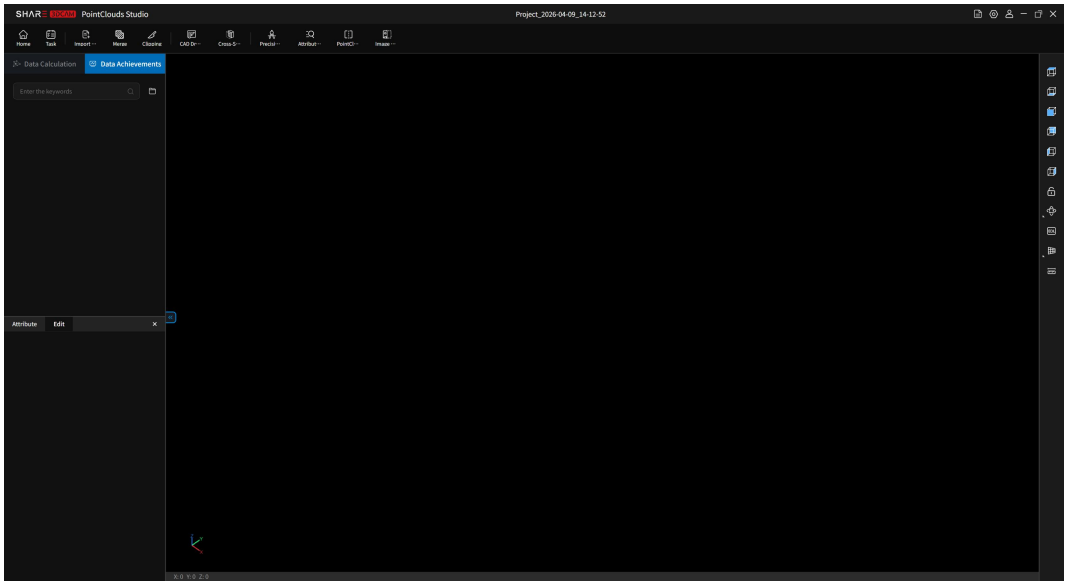


Fig 3-4 Project Browsing Interface

At the top of the [**Data Management**] panel, click the **Data Processing** tab to enter the **Data Processing** interface.

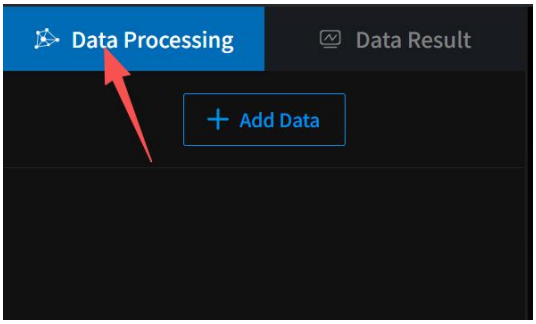


Fig 3-5 Entering the Data Processing Interface

On the **Data Processing** page, click **Add Data** to select the folder containing the copied raw data. After the data is added successfully, related tasks are displayed in the task list.

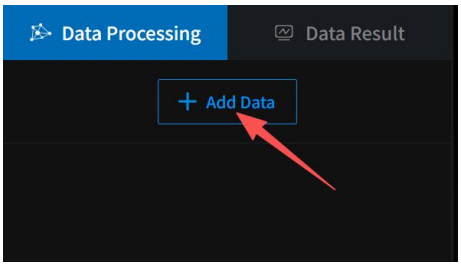


Fig 3-6 Adding Raw Data

Select the corresponding task. A **Mapping Parameters** settings panel appears on the right, where you can configure the reconstruction parameters for the current task.

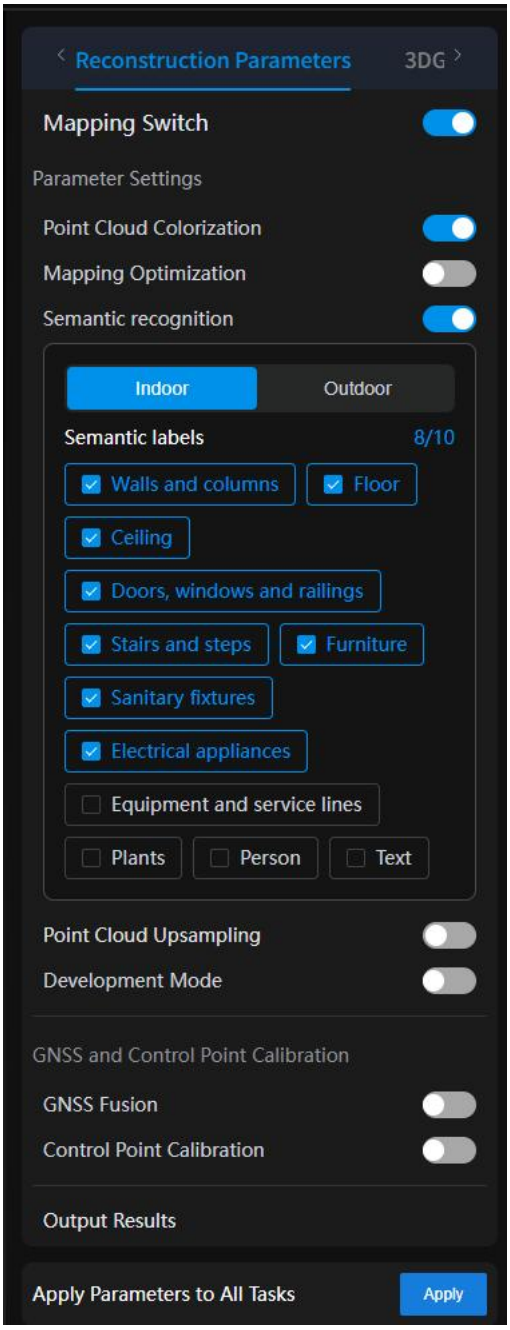


Fig 3-7 Mapping Parameter Settings

After setting the reconstruction parameters, click **Start Processing** to execute the point cloud reconstruction workflow. Click **Task Management** in the main function area to open the **Task Management** window and check the progress of point cloud processing for the project.

If the current task has already been solved, a reprocessing prompt appears: choose Yes to overwrite the original data, No to create new data (with a "_rep" suffix), or close the prompt to cancel this run.

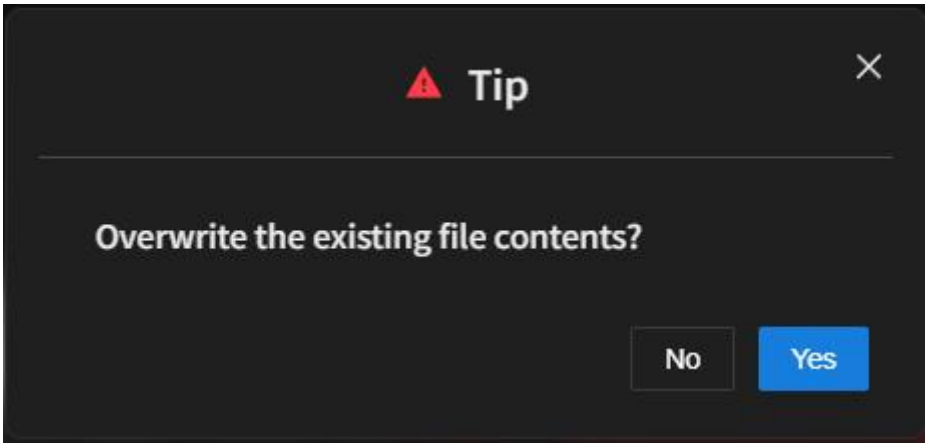


Fig 3-8 Reprocessing Prompt Dialog

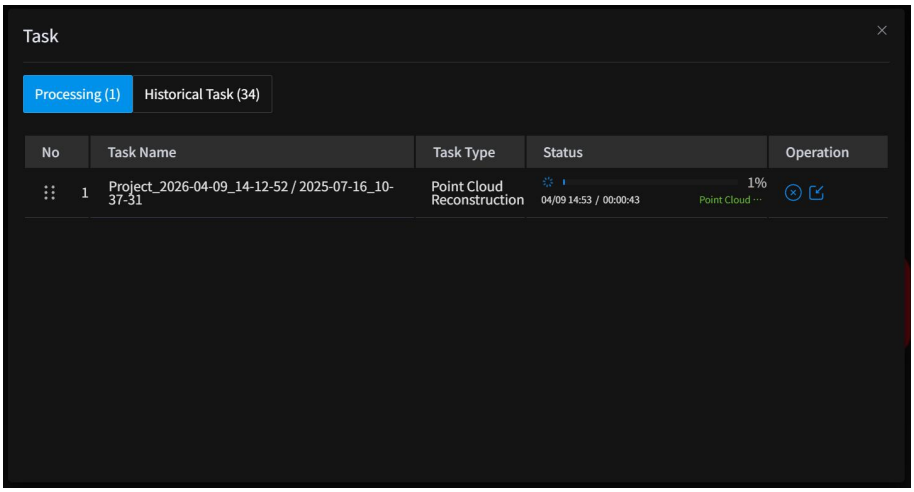


Fig 3-9 Reconstruction Task

Description:

1、If the collected raw data contains **RTK** information, or if control point information was collected at the same time, you can enable **GNSS Fusion** or **Control Point Calibration** for the corresponding task. See the **Parameter Configuration** section for details.

2、If 3D Gaussian reconstruction is required, you can configure Gaussian reconstruction data at the same time, or add the reconstructed results after point cloud reconstruction is completed and perform 3D Gaussian reconstruction separately. See the **Data Processing** chapter for details.

3.3. Data Viewing and Analysis

Click the **Data Results** tab to enter the project browsing interface, or double-click the project in the **[Project Management]** panel to enter the **Project Browsing** interface. You can then view and analyze the reconstructed data, including point clouds and 3D Gaussian layers.

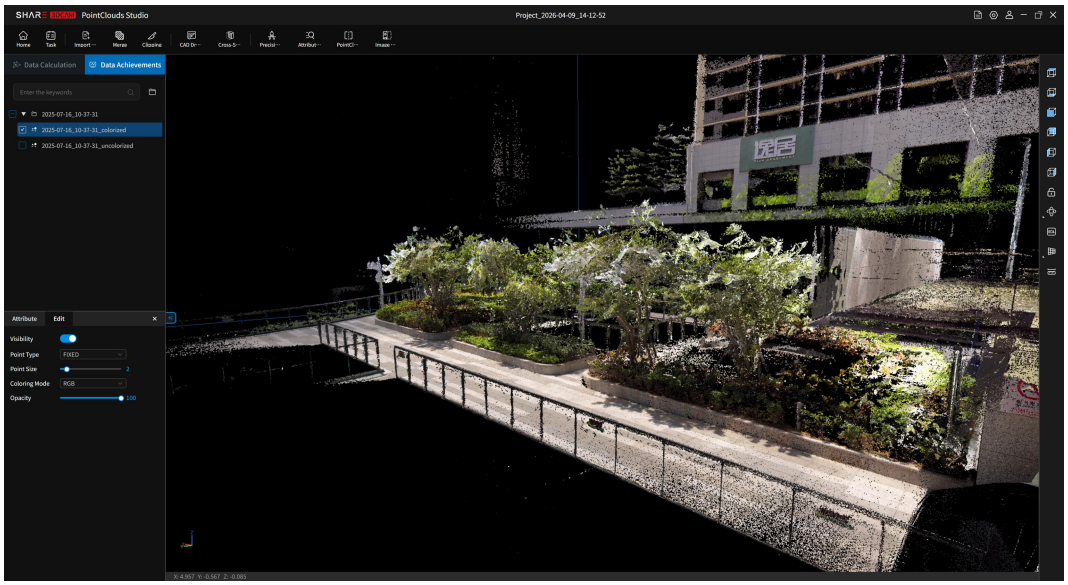


Fig 3-10 Point Cloud Browsing

Chapter 4. User Login and Registration

When you use **SHARE PointClouds Studio** for the first time, a login dialog box appears. If you do not yet have a **SHARE** account, you can register one. After you complete login verification, the software remembers the last account used and automatically skips the login step the next time it is opened.

4.1. User Login

On the **User Login** page, enter your phone number (or email address) and password, then click **Log In** button.

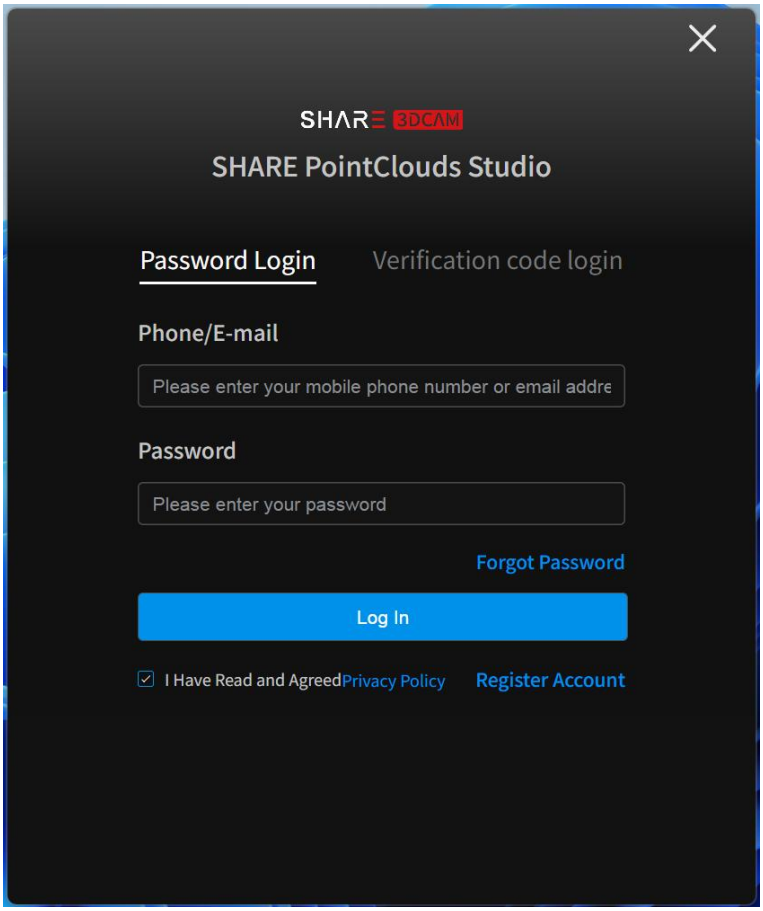


Fig 4-1 Password Login

You can also log in with a verification code. Click **Verification Code Login** to switch to that page, enter your phone number or email address, click **Send Verification Code** to receive the code, and then click **Log In** button after entering it.

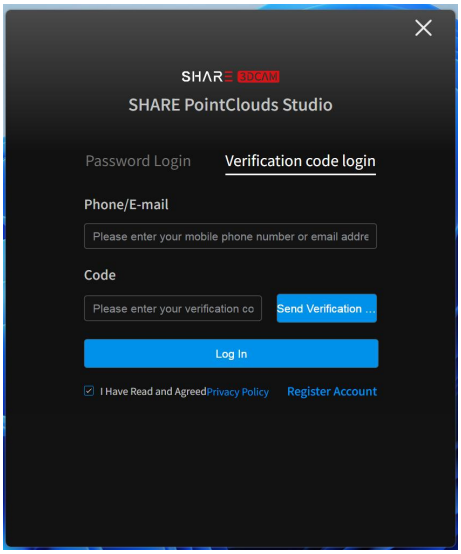


Fig 4-2 Verification Code Login

4.2. Registration Account

On the **User Login** page, click **Register Account** to open the registration page, then complete the required information to register a **SHARE** account. Registration is supported by phone number (Mainland China numbers only) or email address.

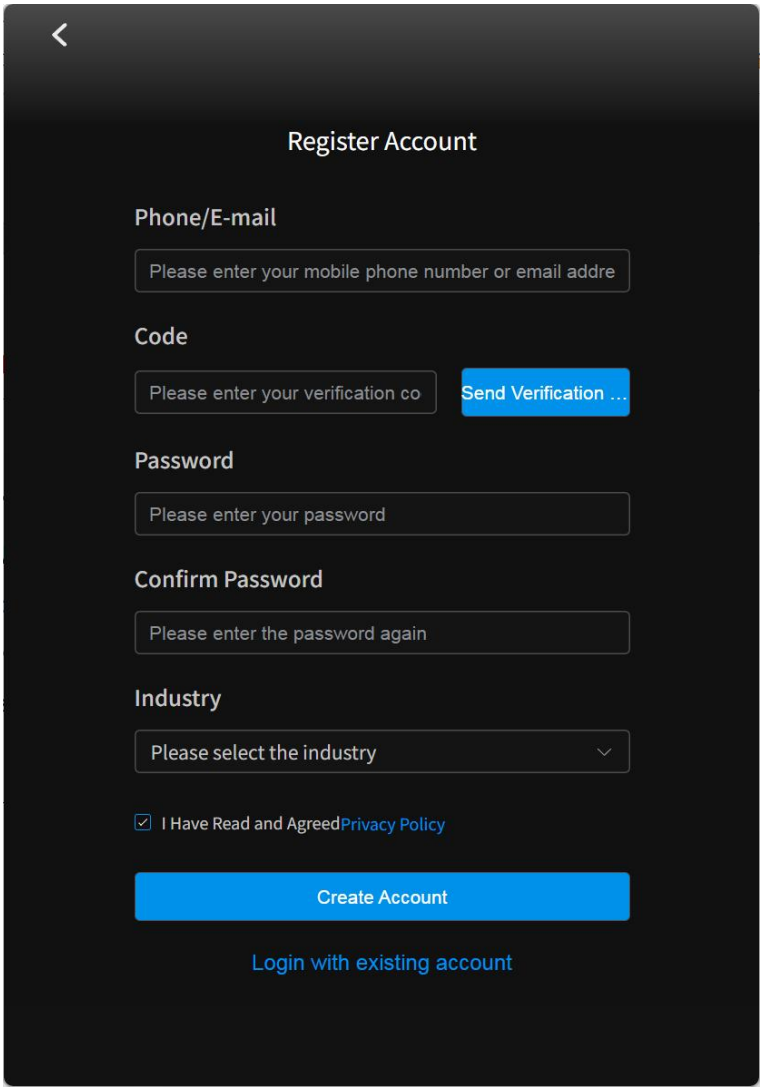


Fig 4-3 User Registration Interface

4.3. Forgot Password / Change Password

On the login page, click **Forgot Password** to go to the password recovery page. You can reset your password using the phone number or email address used during registration.

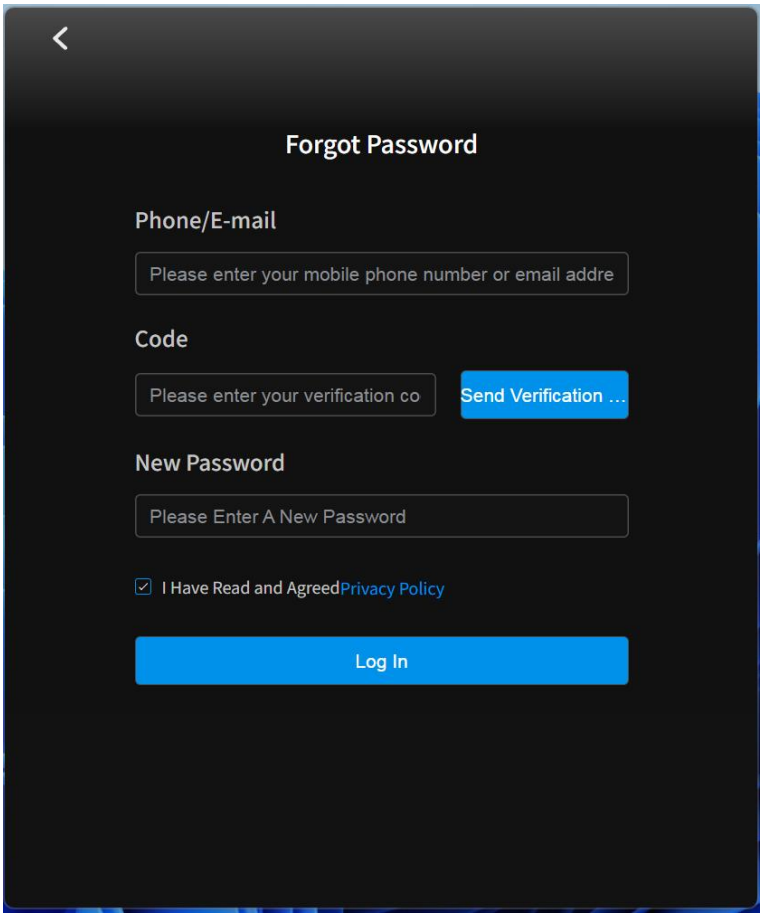


Fig 4-4 Forgot Password

4.4. Log Out

On the main software interface, move the pointer over the **Login** button in the upper-right corner. In the pop-up menu, click **Log Out** to sign out of the current account.

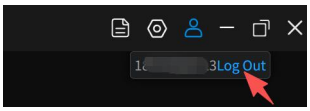


Fig 4-5 Log Out

Chapter 5. Project Management

After the software starts, it enters the main interface, also called the **Project Management** interface.

"project" is a core concept in the software. It is used to organize and manage the raw data, reconstruction parameters, and results required during the data processing.

SHARE PointClouds Studio uses the **[Project Management]** panel to organize related projects. This panel is located on the left side of the software and supports creating, importing/exporting, and deleting projects. You can also double-click a project to open it in the **Project Browsing** interface.

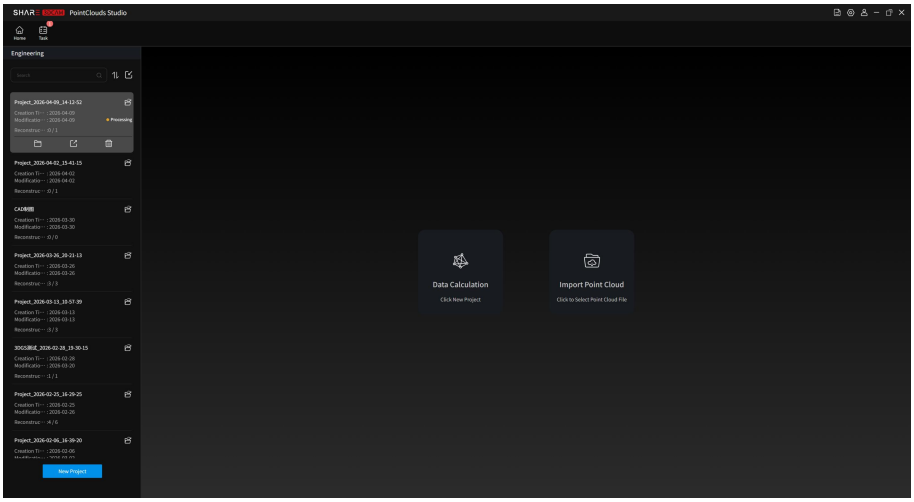


Fig 5-1 Project Management Interface

5.1. [Project Management] Panel

5.1.1. Overview

The **[Project Management]** panel is located on the left side of the software and is used to manage created projects. The elements in this panel are shown below:

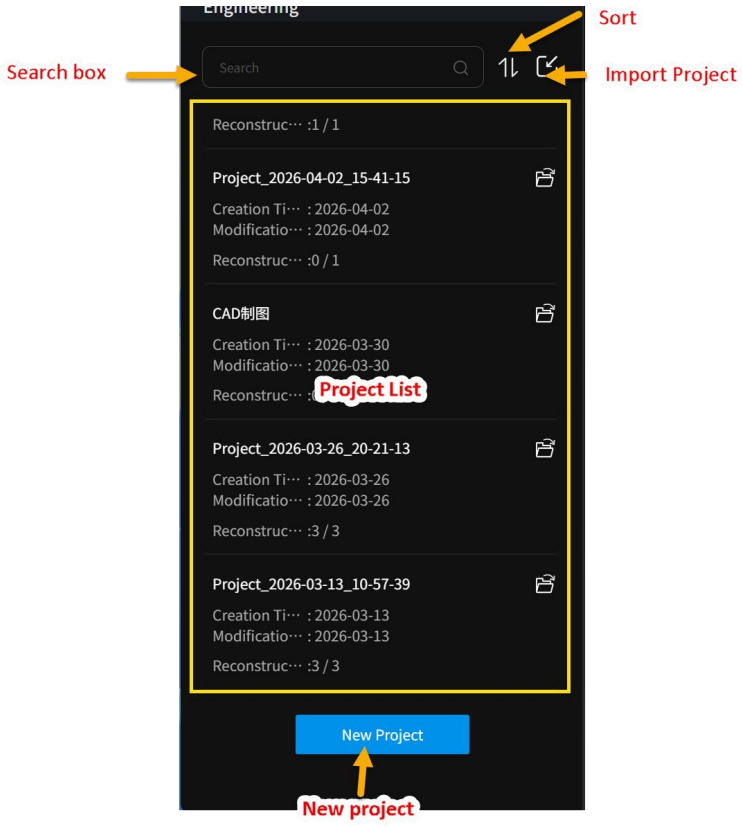


Fig 5-2 [Project Management] Panel

Search box: Enter keywords in the search box to filter projects.

Sort: Click **Sort** to sort projects by **Creation Time** in ascending or descending order.

Import Project: Supports importing external projects. See **Import Project** for details.

Project list: Displays all projects in list form. See **Project List** for details.

New Project: Creates a new project. See **New Project** for details.

5.1.2. Project List

The **[Project Management]** panel displays all projects in the software in list form. Newly created projects appear at the top of the list. The elements are described below:

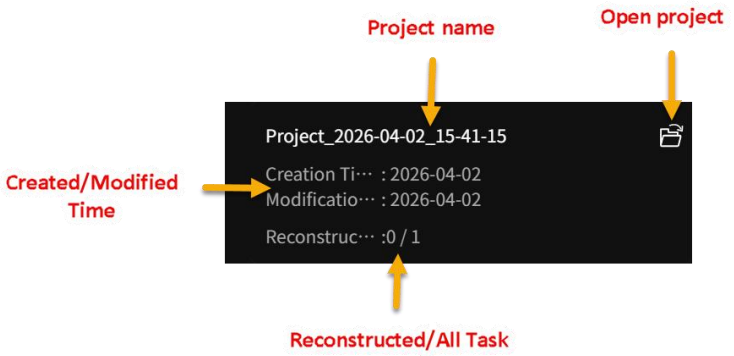


Fig 5-3 Description of Project Record Elements

Click a project to select it. Operation buttons are then displayed at the bottom of the project card, as shown below:

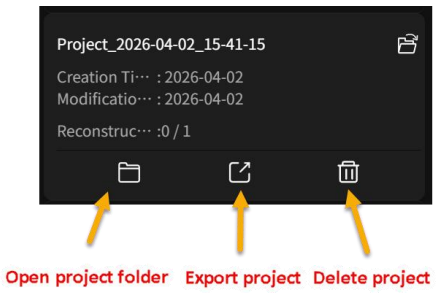


Fig 5-4 Project Operation Buttons

5.2. New Project

Click **New Project** at the bottom of the **[Project Management]** panel. The **New Project** dialog box appears.

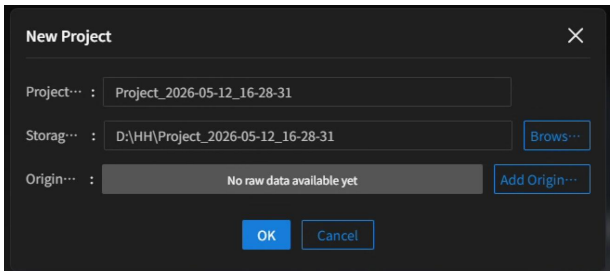


Fig 5-5 New Project Dialog Box

The parameters are described as follows:

Project Name: The system automatically generates a project name based on the creation time. Users can also modify it manually.

Storage Path: The save path for the project. The default path is related to the **Default Workspace** in **System Settings** (see **System Settings**). Click **Brows...** to set a custom path.

Raw Data: Optional. You can add one or more raw data sets. Raw data can also be added later in the **Data Processing Panel**.

Click **OK** to enter the **Project Browsing** interface. See the **Project Browsing** chapter for details.

After the project is created successfully, a corresponding record appears at the top of the **[Project Management]** panel.

5.3. Project Operations

For existing projects, the software supports opening a project, opening its folder, exporting a project, importing a project, deleting a project, and other operations.

5.3.1. Open Project

Double-click the project record, or click **Open Project** button, to open the project and enter the **Project Browsing** interface. See the **Project Browsing** chapter for details.



Fig 5-6 Open Project

5.3.2. Open Project Folder

In the **[Project Management]** panel, select the target project and click **Open Project Folder** to view the project-related data.

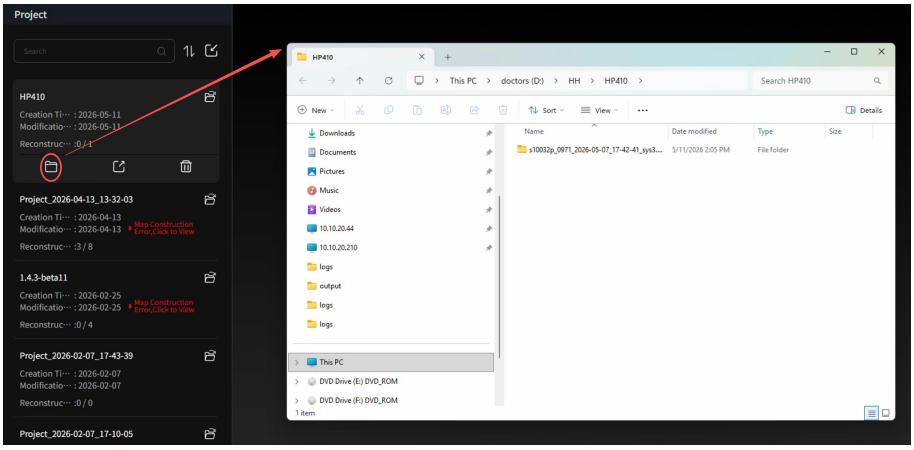


Fig 5-7 Open Project Folder

5.3.3. Export Project

In the [**Project Management**] panel, select the target project and click **Export Project** to export the project as a **ZIP** file. You can also rename the exported project.

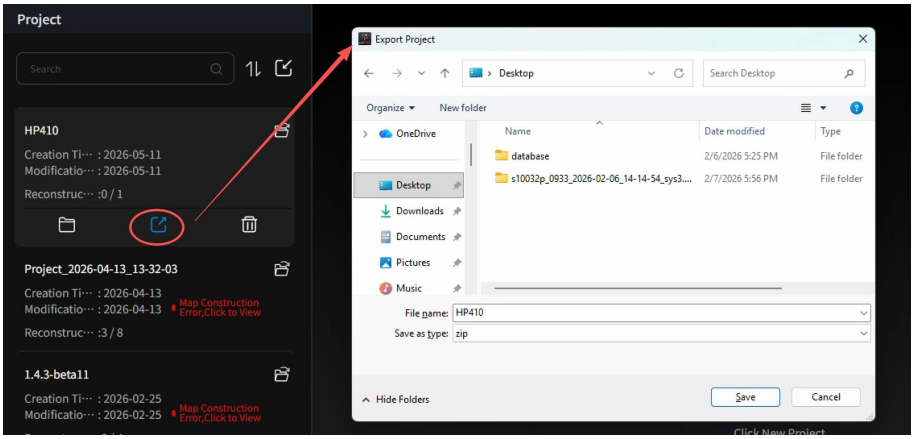


Fig 5-8 Export Project

Click **Save** to perform the export. A pop-up window displays the export progress. When the export is complete, a notification bubble is shown.

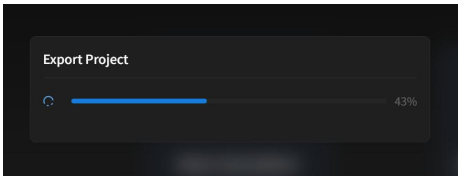


Fig 5-9 Project Export Progress

5.3.4. Import Project

Import an exported **ZIP** project file into the software. For information on how to obtain the **ZIP** project file, see **Export Project**.

Click **Import Project** to open the **Import Project** dialog box, select the **ZIP** file location, and click **Open** to perform the import.

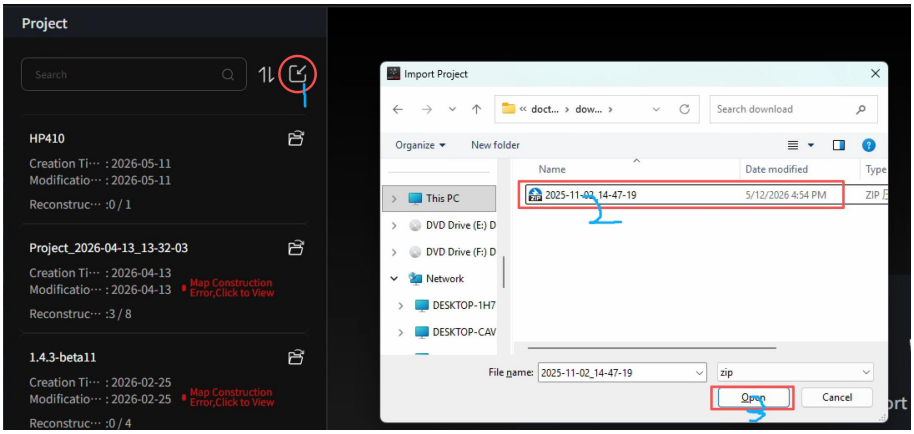


Fig 5-10 Import Project

The progress is displayed during project import.

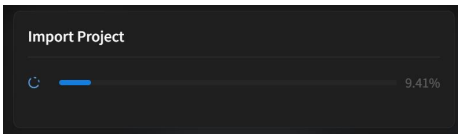


Fig 5-11 Import Progress

After the project import is complete, a new record is added to the top of the [**Project Management**] panel.

5.3.5. Delete Project

In the [**Project Management**] panel, select the target project and click **Delete Project** to remove the current project.

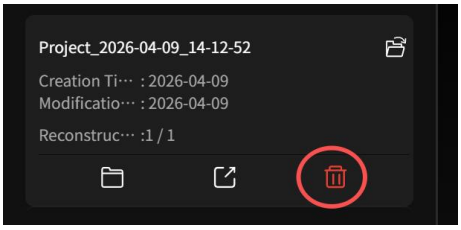


Fig 5-12 Delete Project

5.3.6. Rename Project

In the [**Project Management**] panel, click the name of the target project to rename it, then press keyboard “**Enter**” to save.

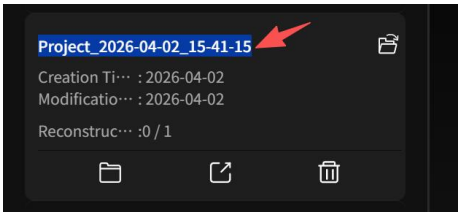


Fig 5-13 Rename Project

5.4. Quick Access

The quick-access area supports quickly creating a project and quickly browsing point clouds, as shown below:

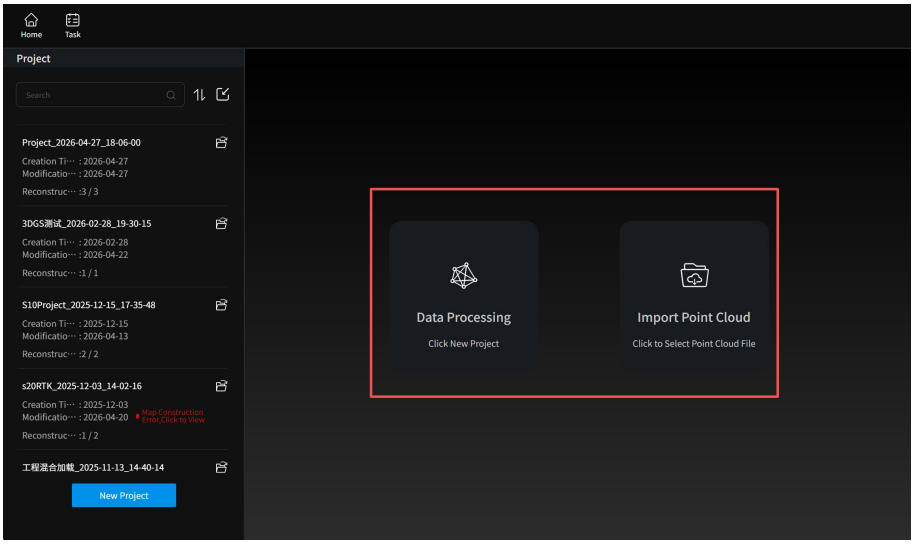


Fig 5-14 Quick Access Entry

5.4.1. Quickly Create a Project

Click the **Data Processing** shortcut area to open the **New Project** dialog box.

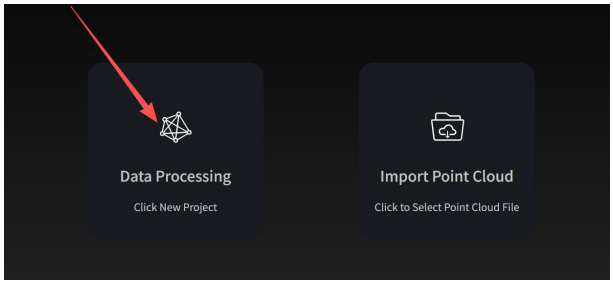


Fig 5-15 Quick New Project

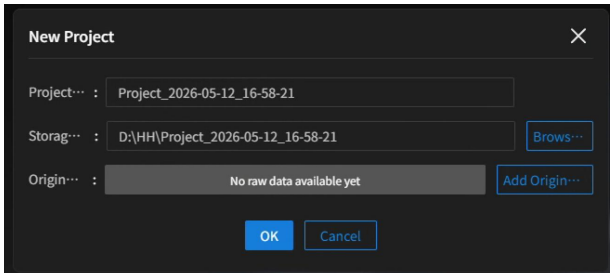


Fig 5-16 New Project

The remaining steps are the same as those in **New Project**. See that section for details.

You can also drag a raw-data folder from File Explorer onto the "Data Processing" icon. The New Project dialog opens, names the project after the folder and adds that folder as raw data.

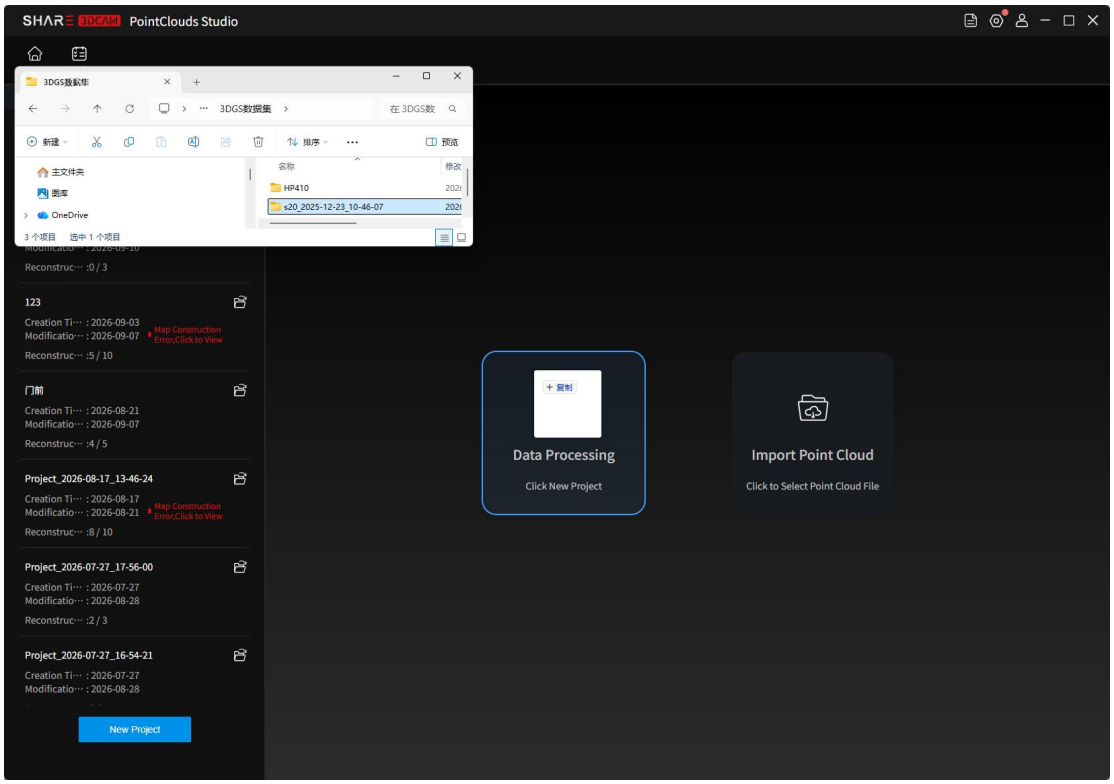


Fig 5-17 Dragging a Folder onto the Data Processing Icon

5.4.2. Quickly Browse Point Clouds

Click the **Import Point Cloud** shortcut area to open the **Import Point Cloud** dialog box. One or more point cloud files can be added.

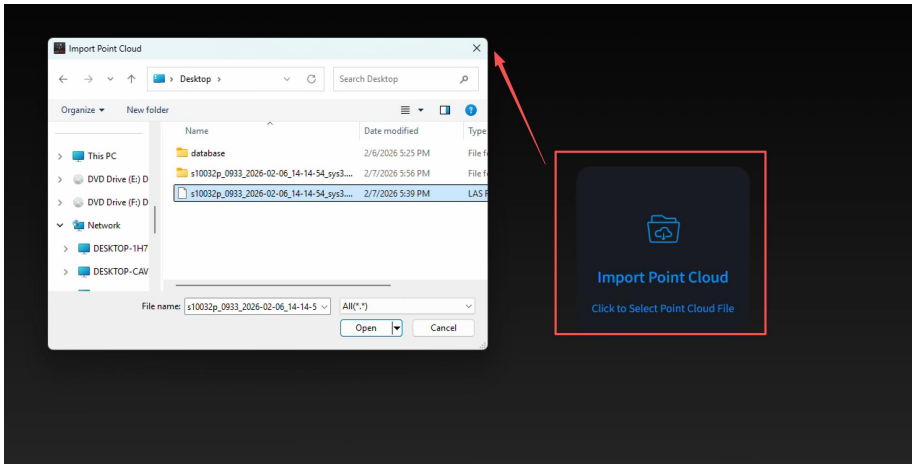


Fig 5-18 Quick Point Cloud Browsing Entry

After selecting point cloud files, click **Open** to enter the **Project Browsing** interface. The selected point cloud data is loaded into the scene.

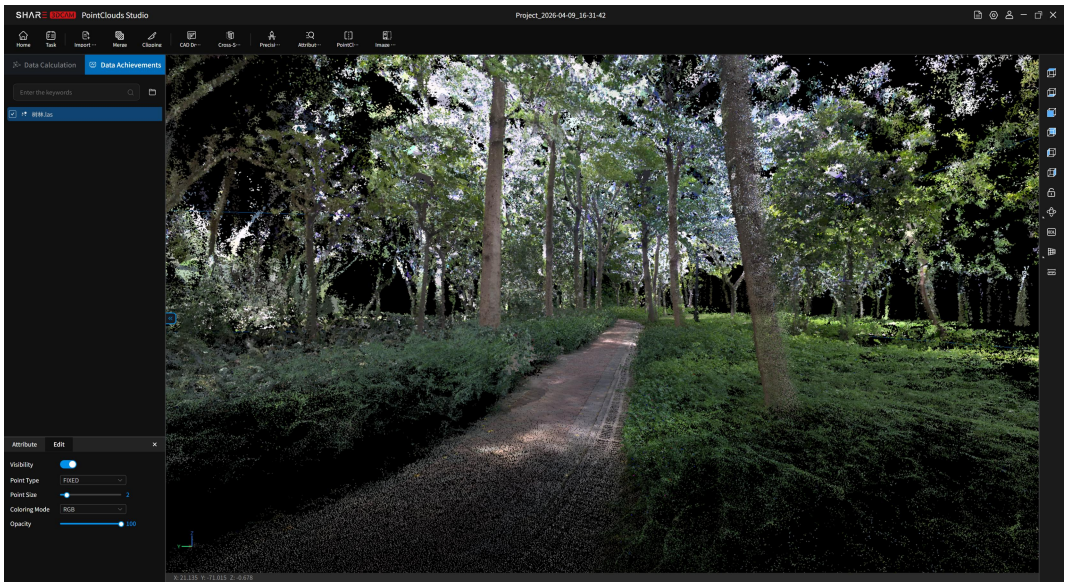


Fig 5-19 Quick Point Cloud Browsing

At this point, the software creates a corresponding project. After returning to **Main Interface** - [**Project Management**], the user can operate this project from the top of the panel.

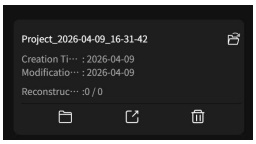


Fig 5-20 Associated Project Record

Chapter 6. Data Processing

Data Processing is the core module of the software. It is used for point cloud reconstruction and 3D Gaussian reconstruction from raw data. **Double-click** a project to enter the **Project Browsing** interface, then click the **Data Processing** tab in the [**Data Management**] panel on the left to enter the **Data Processing** interface.



Fig 6-1 Data Processing Interface

6.1. Data Processing Panel

6.1.1. Overview

The **[Data Processing] Panel** manages reconstruction tasks in the project in list form. It supports adding raw data, submitting reconstruction tasks (starting processing), opening the folder that contains a task or its data, and removing tasks.

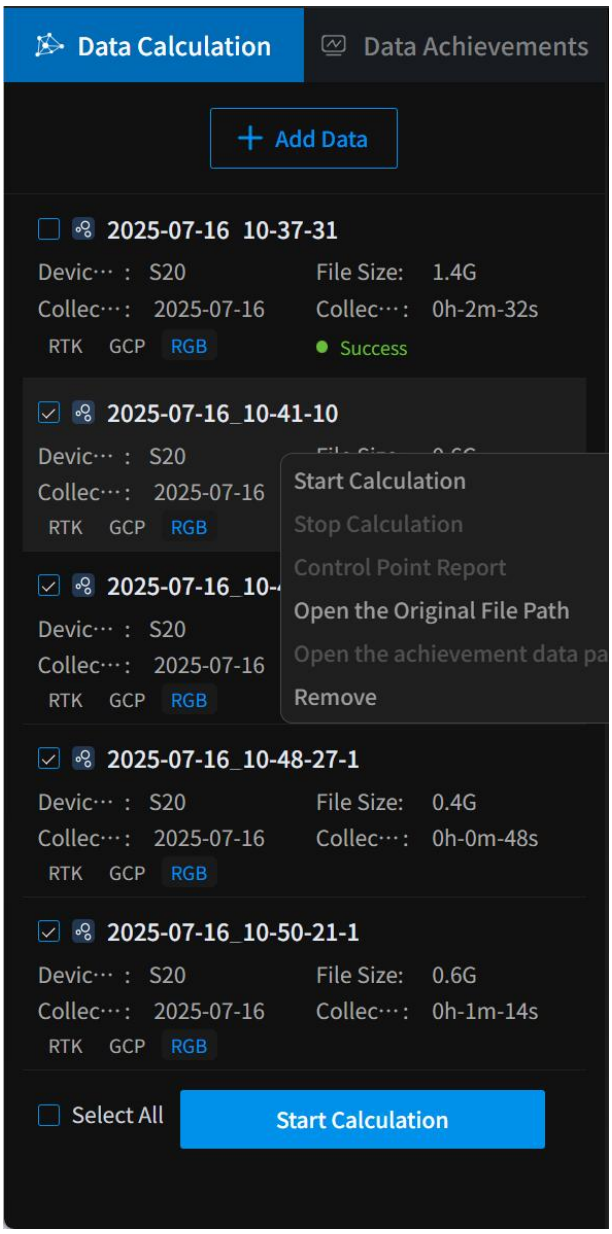


Fig 6-2 Data Processing Panel

6.1.2. Adding Raw Data

Click **Add Data** at the top of the panel to open the **Add Raw Data** dialog box. Select the folder containing the raw data, then click **Select Folder** to add the data.

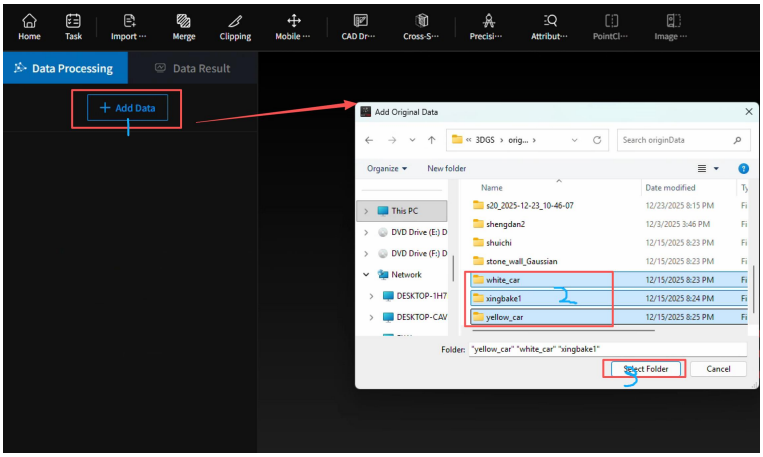


Fig 6-3 Adding Raw Data

After the data is added, it is displayed in the list.

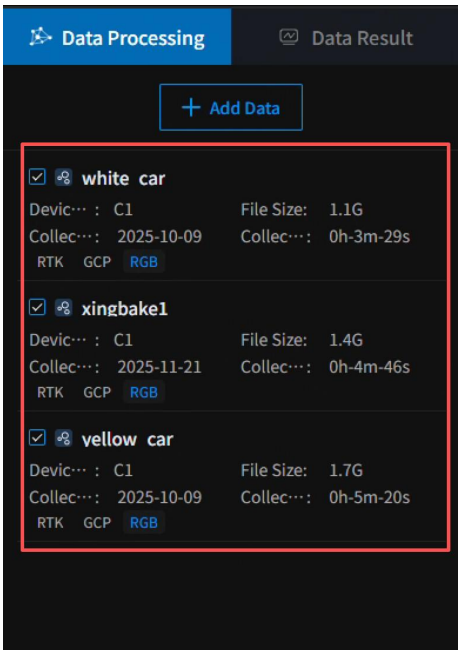


Fig 6-4 Task (Data) List

Description:

1.For 3D Gaussian reconstruction, the software also supports adding the result data generated after point cloud reconstruction. You can perform 3D Gaussian reconstruction using the result data, provided that **Undistorted Photo Data** was enabled during reconstruction and the shutter capture interval of the raw data is no more than 0.5 seconds per shot.

Click **Add Data**, locate the output folder generated after point cloud reconstruction, select it, and click **OK** to add it to the list in the **Data Processing Panel**.

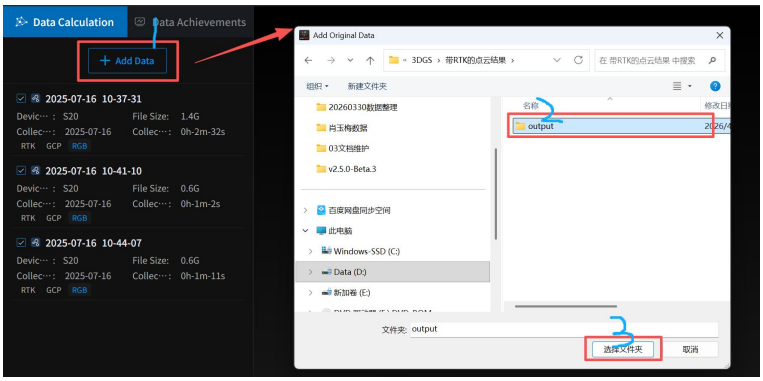


Fig 6-5 Adding Result Data for 3D Gaussian Reconstruction

2. When raw data is added, the system validates it. If the raw data is incomplete or abnormal, a notification bubble appears.



Fig 6-6 Invalid Data Prompt

3. Multiple raw data sets can be added at one time. For example, hold down **Ctrl** and select multiple raw-data folders one by one, then click **Select Folder** to add them to the raw data list. You can also click **Add Data** again after one batch has been added to continue adding more raw data.

6.1.3. Reconstruction Parameter Configuration

Select a task in the task list, and the corresponding reconstruction parameters are displayed on the right, including **Point Cloud Mapping Parameters** and **3D Gaussian Reconstruction Parameters**. You can configure the reconstruction parameters for the task here. For details, see **Parameter Configuration**.

6.1.4. Submitting Mapping Tasks (Start Processing)

Select the tasks to be reconstructed in the task list. You may also click **Select All** at the bottom to select all tasks. Then click **Start Processing** to add the tasks to the task queue for reconstruction.

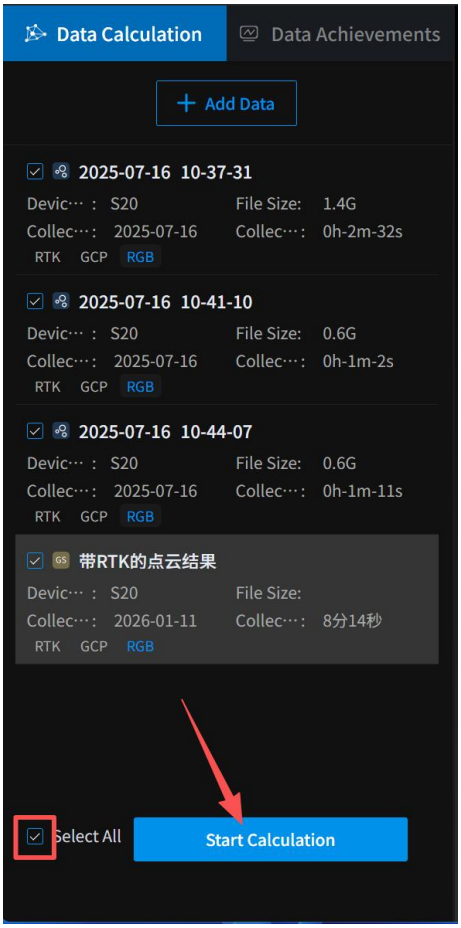


Fig 6-7 Submitting Reconstruction Tasks

After a mapping task is submitted, the task list displays reconstruction progress information such as task status and progress.

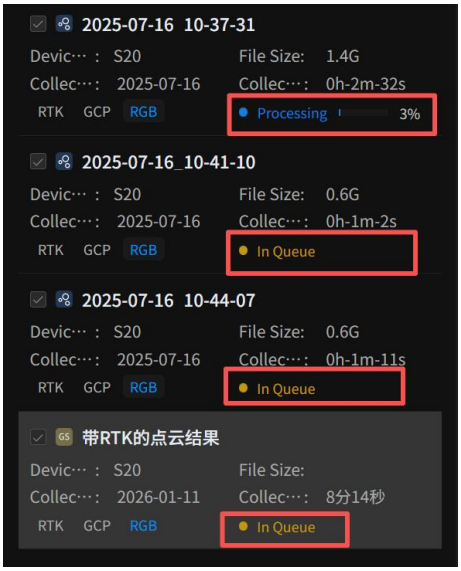


Fig 6-8 Task Status Information

You can also click **Task Management** in the main function area to view the detailed status of the current reconstruction tasks. See **Task Management** for details.

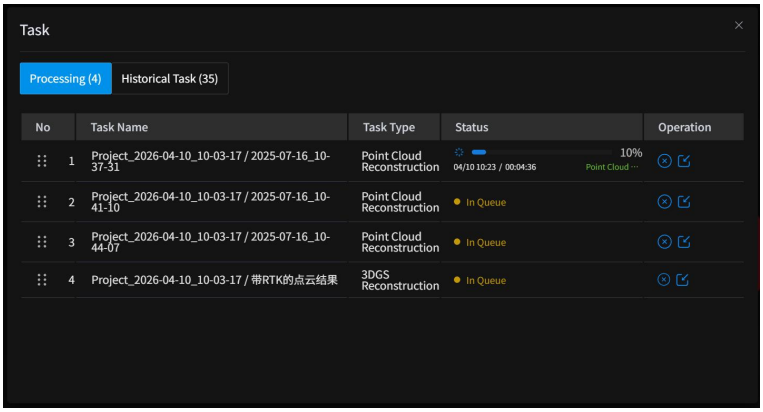


Fig 6-9 Task Management

6.1.5. Task Right-Click Operations

Move the pointer over the target task and right-click to open the operation panel. Available actions include submitting a mapping task (start processing), stopping processing, opening the control point report, opening the raw data path, opening the result data path, and removing the task.

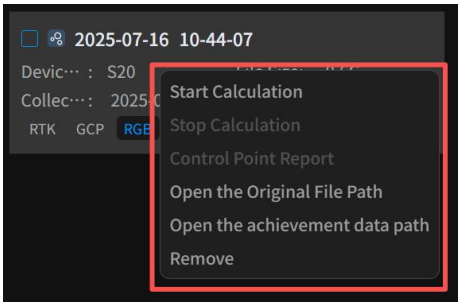


Fig 6-10 Task Right-Click Operation Panel

Submit (single) mapping task / start processing: Adds the task to the task list for point cloud reconstruction. This is the same as **Submitting Mapping Tasks (Start Processing)**.

Stop processing: Terminates a task that is queued or currently being reconstructed.

Control point report: Generates the control point report file.

Open raw data path: Opens the folder containing the raw data.

Open result data path: Opens the folder containing the processed result data.

Remove task: Removes the task from the task list.

6.2. Parameter Configuration

6.2.1. Overview

The **Parameter Configuration panel** is used to configure task parameters in the **Data Processing Panel**, including mapping parameters and 3DGS reconstruction parameters. After configuration is complete, submit the task and it will be reconstructed according to the configured parameters.

When you select the corresponding data (task) in the **Data Processing panel**, the mapping parameter configuration interface for that task is displayed on the right.

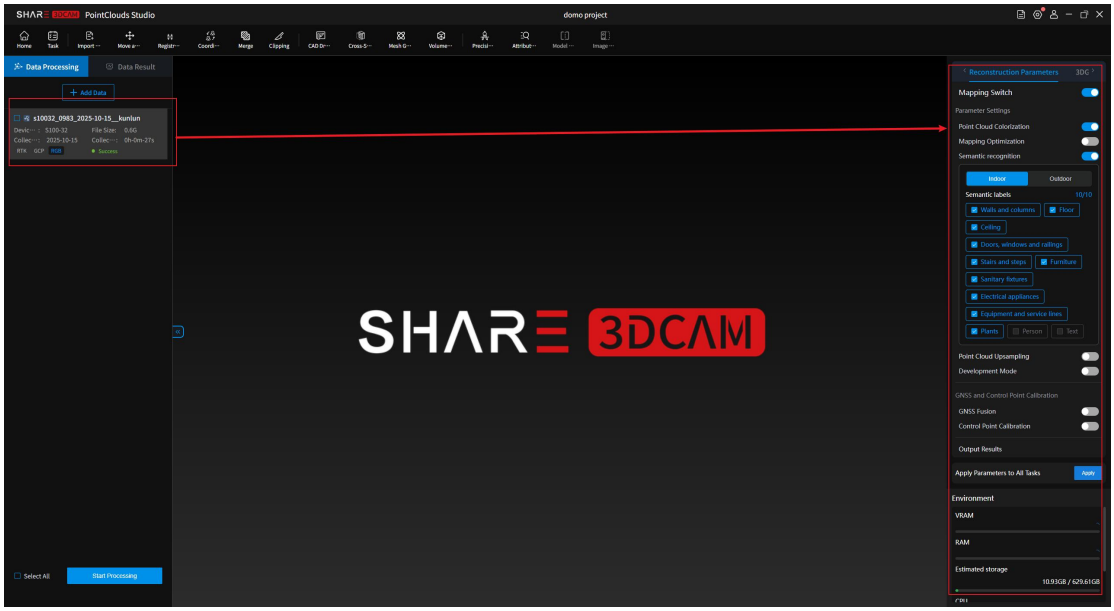


Fig 6-11 Mapping Parameter Configuration

6.2.2. Mapping Parameter Description

Mapping parameters are mainly used to configure parameters for point cloud reconstruction, including basic parameter settings, GNSS and control point settings, and output result settings.

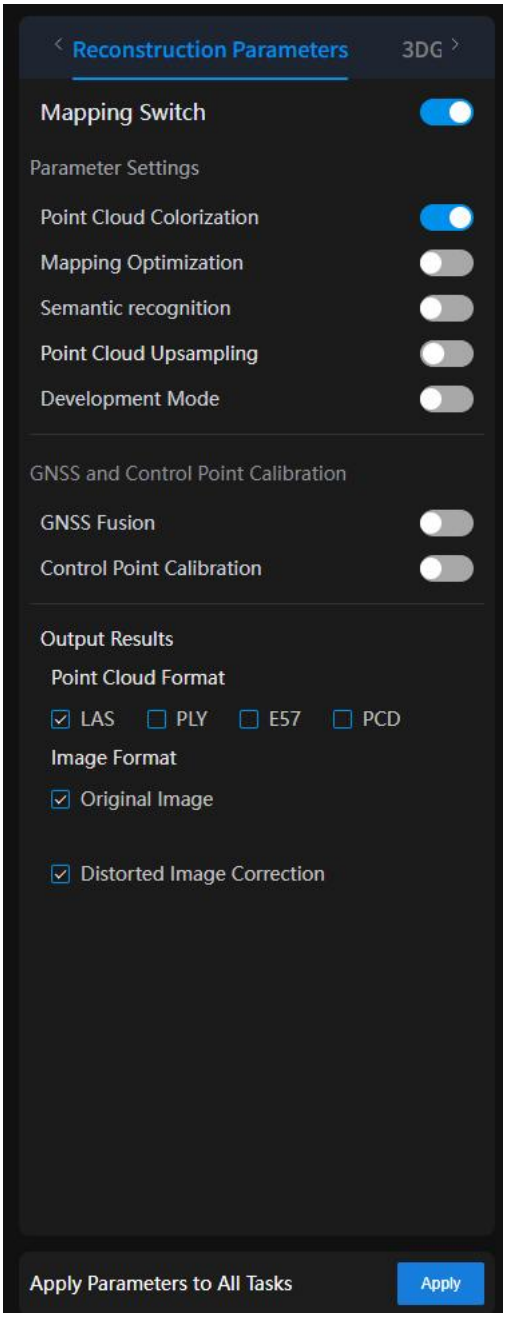


Fig 6-12 Mapping Parameters

6.2.2.1. Basic Parameter Settings

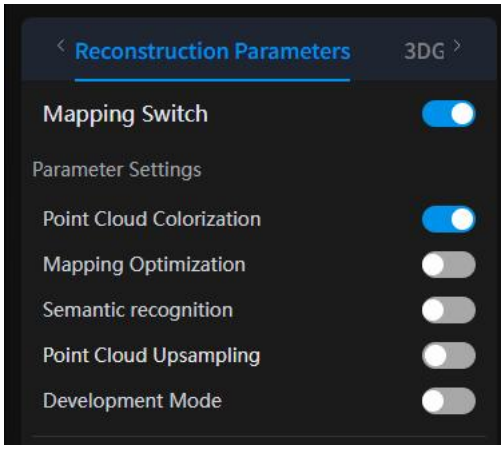


Fig 6-13 Enabling the Colorized Point Cloud Parameter

Point cloud colorization: Controls whether the reconstructed point cloud is output as a color point cloud. This parameter is enabled by default.

Mapping Optimization: Disabled by default. When enabled, it can improve the point cloud colorization result, but processing time will increase significantly.

Semantic recognition: Controls whether object categories in the point cloud are recognized during reconstruction; the switch is on by default. When on, select the recognition scene ("Indoor" or "Outdoor") and check the semantic labels to recognize (the first 8 are checked by default, up to 10; custom labels supported).

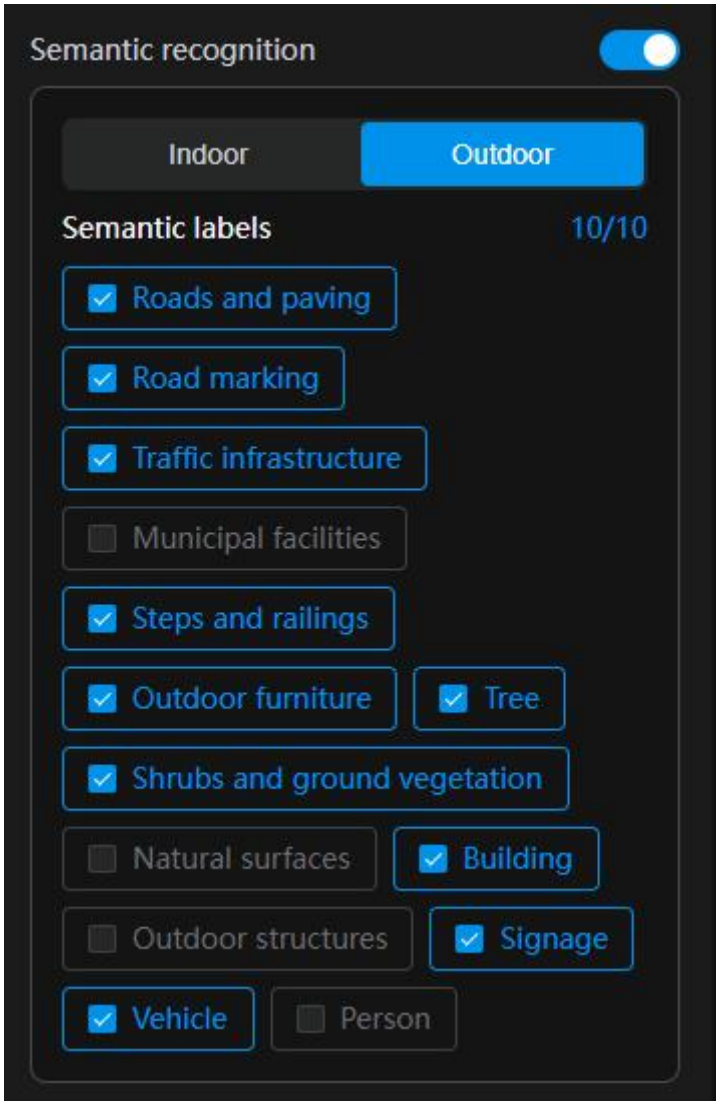


Fig 6-14 Semantic Recognition Settings

Point Cloud Upsampling: Default is off. When enabled, the generated point cloud can be encrypted with two options: 10 mm and 5 mm.



Fig 6-15 Point Cloud Upsampling Settings

Development Mode: This parameter is mainly used by R&D personnel for troubleshooting. After expansion, you may enable **Output Point Clouds by Frame**. It is disabled by default. When enabled, **PCD-format** point clouds for each frame are output to the result folder after processing is completed.

Caution: Development Mode is intended only for troubleshooting and should be enabled under the guidance of Technical Support. Outputting point clouds by frame can significantly increase storage usage.

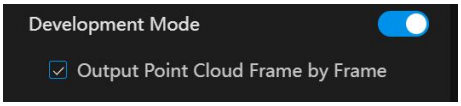


Fig 6-16 Extended Parameters

6.2.2.2. GNSS Fusion

Coordinate transformation based on **GNSS** requires an **RTK** module to be mounted during field scanning, along with relatively stable satellite data and a sufficient number of fixed solutions during the scan. This function not only converts point cloud data from a relative coordinate system to an absolute coordinate system, but also uses **GNSS** trajectory constraints to improve **SLAM** mapping accuracy and obtain higher-precision point cloud data.

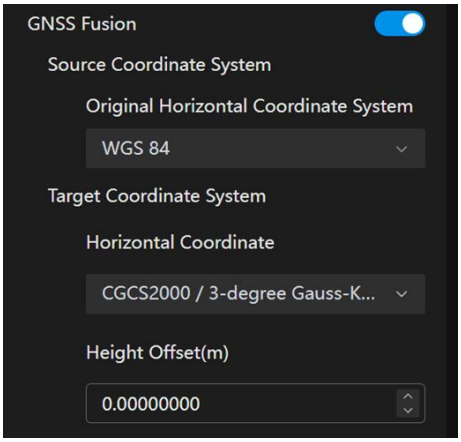
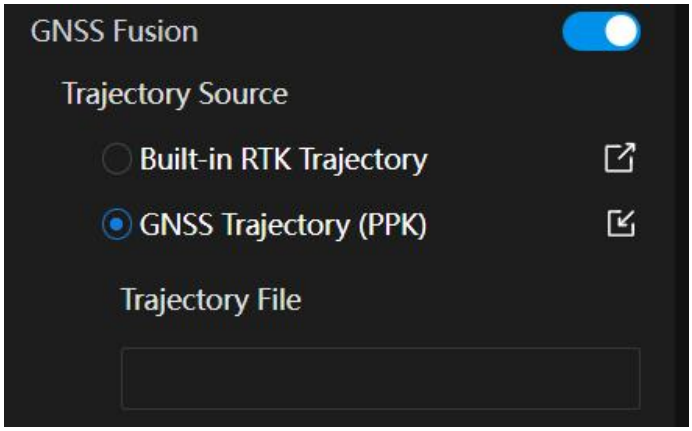


Fig 6-16 GNSS Fusion Parameters

6.2.2.2.1. Trajectory Source

Used to select the trajectory file used as the data source for GNSS Fusion. You can select the RTK trajectory file built into the device, or a GNSS trajectory file generated by PPK processing or manual coordinate adjustment. Currently, only POS files in the format defined by RTKLIB are supported.



"Trajectory Source" Parameter

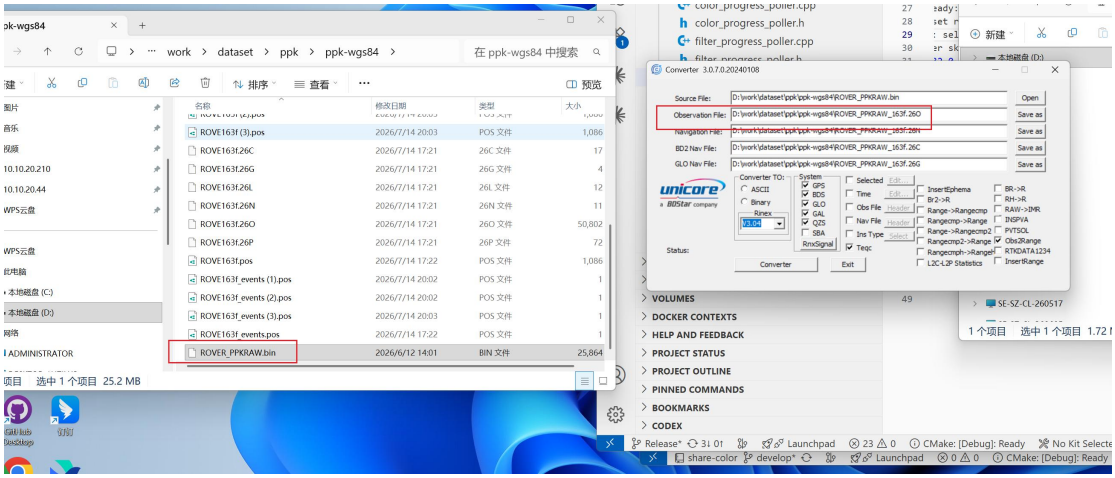
6.2.2.2.2. PPK Processing Workflow

Step 1: Prepare Data

Use the data conversion tool to process the raw data collected by the device and export:

- Rover Observation File
- Rover Navigation File

At the same time, prepare the base station/reference station observation file for the corresponding time period.



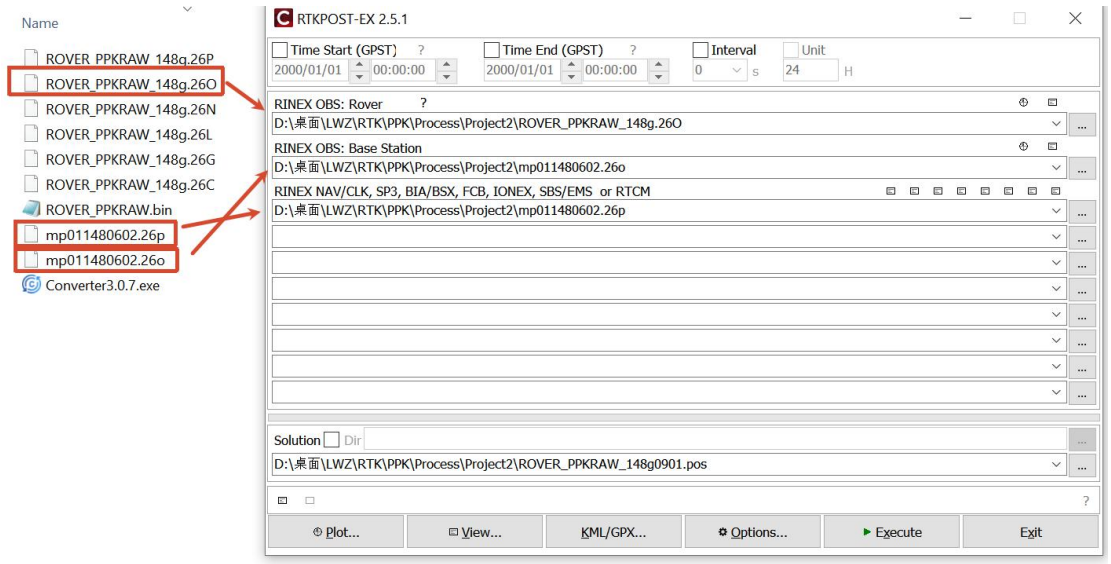
Step 2: Import Data

Open **RTKLIB_EX (Download Link:** https://github.com/rtklibexplorer/RTKLIB/releases/download/v2.5.1/RTKLIB_EX_2.5.1.zip **)** and select: rtkpost.exe

Import the following files in sequence:

- Rover: rover observation file
- Base: base station/reference station observation file
- Navigation: navigation file

Only one valid navigation file needs to be selected.



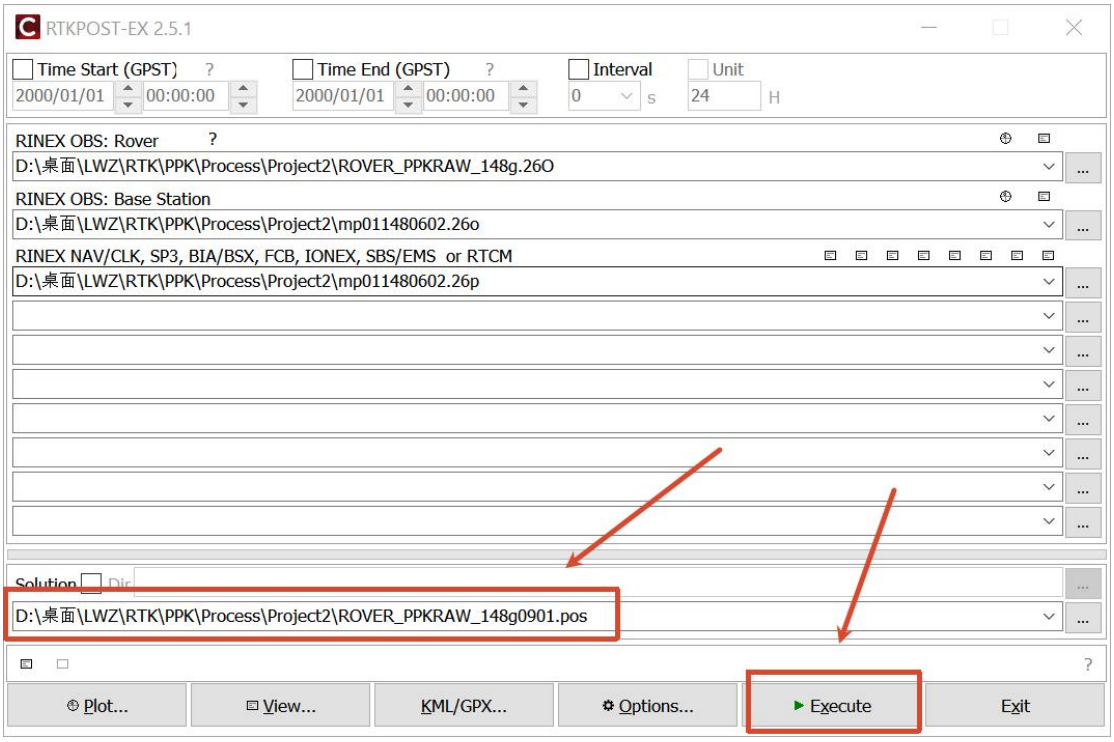
Step 3: Start Processing

After confirming that the data are correct and Set save path, click:

Process

Wait for software to complete PPK processing.

This file can be used as the subsequent GNSS (PPK) trajectory input for point cloud mapping/trajectory fusion.



Step 4: View Results

After the calculation is complete, use **rtkplot.exe** to view the trajectory results and focus on the following:

- Whether the trajectory is complete and continuous;
- Whether there are obvious gaps;

• Whether fixed solutions cover the main acquisition trajectory.



6.2.2.2.3. Source Coordinate System

1. The original geographic coordinate system of the RTK account during data acquisition. If the system cannot retrieve this information automatically, you must configure it manually. Click the "**Original Horizontal Coordinate System**" dropdown to select the default or commonly used coordinate system, or click "Horizontal Coordinate System Database" to set another coordinate system.

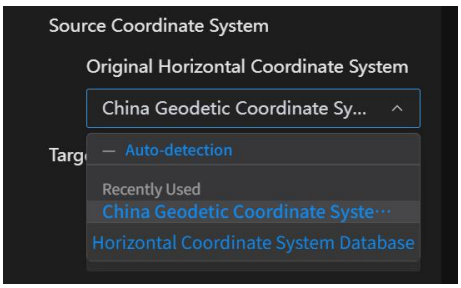


Fig 6-17 Original Coordinate System setting

2. Enter the coordinate system name or authorization code, select the corresponding coordinate system search result, and click "OK".

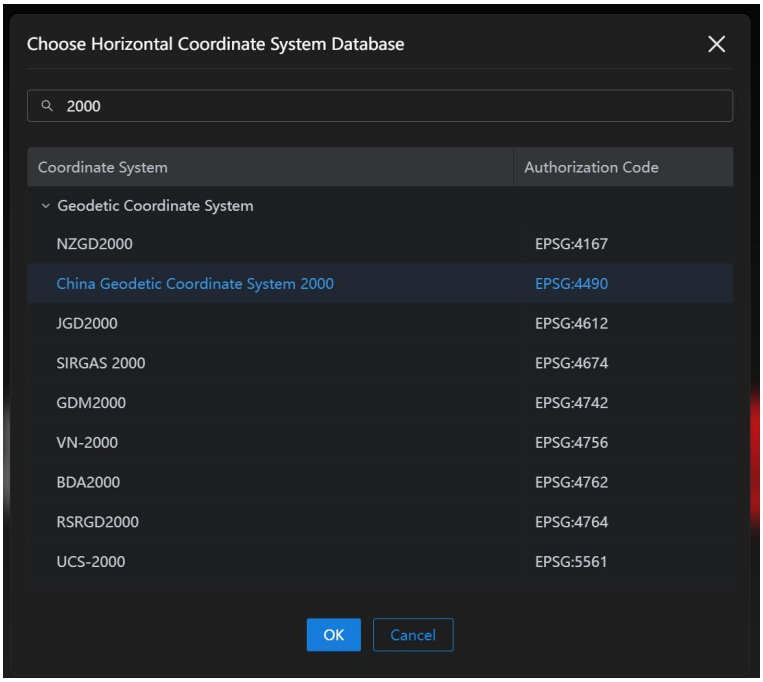


Fig 6-18 Known Coordinate System Search

6.2.2.2.4. Output Coordinate System

By default, the output coordinate system is Known Coordinate System. Click the **Horizontal Settings** drop-down list to select the default coordinate system or a commonly used coordinate system. You can also click **Horizontal Coordinate System Database** to configure other coordinate systems.

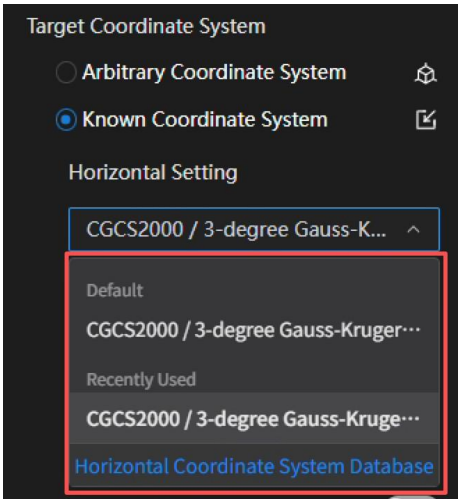


Fig 6-19 Horizontal Coordinate System Settings

Enter the coordinate system name or authorization code, select the corresponding search result, and click **OK**.

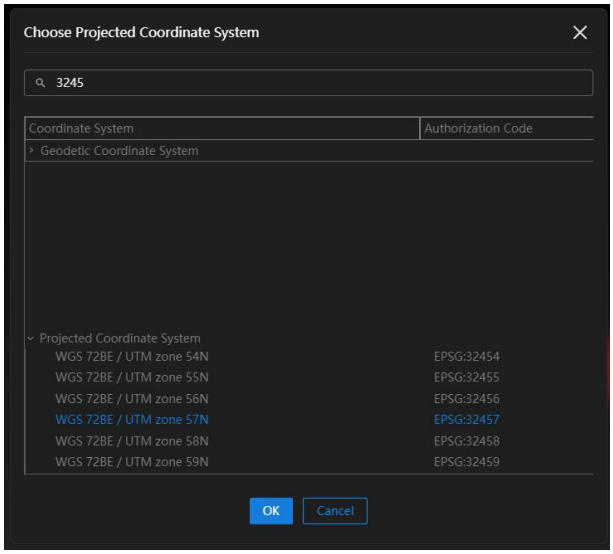


Fig 6-20 Known Coordinate System Search

6.2.2.2.5. Height Offset

Apply an overall offset to the point cloud's elevation; the default value is "0", which users can modify manually.



Fig 6-21 height offset

6.2.2.3. Control Point Calibration

If control points were also collected during raw data acquisition, you can enable **Control Point Calibration** for the reconstruction task and use external control points to transform the point cloud data into the corresponding absolute coordinate system.

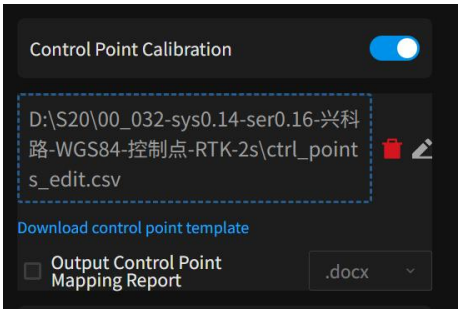


Fig 6-23 Enabling Control Point Calibration

6.2.2.3.1. Control Point Calibration Settings

Turn on **Control Point Calibration**, then click **Download Control Point Template File** to download the corresponding template. The software generates the template based on the original collected data.

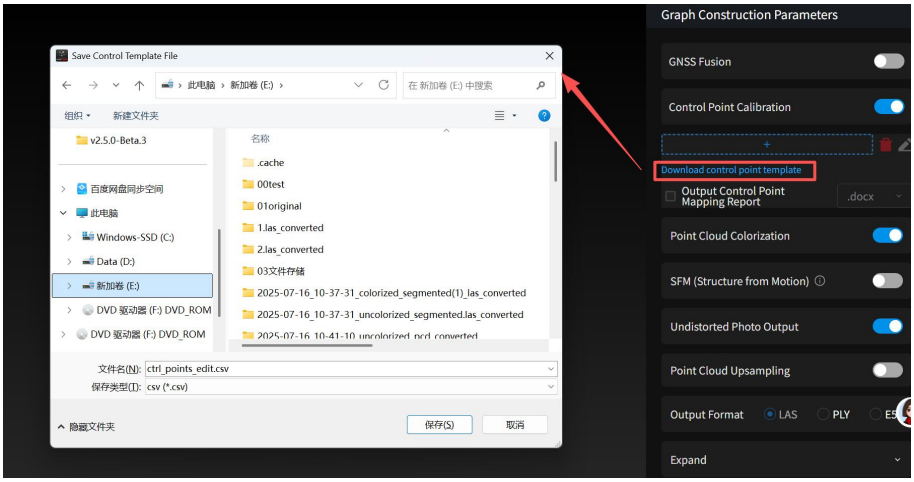


Fig 6-24 Downloading the Control Point Template

Open and edit the control point template file in Excel. The Name and timestamp fields are the control point name and corresponding timestamp added during device data collection. The x/y/z fields represent the easting / northing / elevation of the corresponding position obtained using external **RTK**.

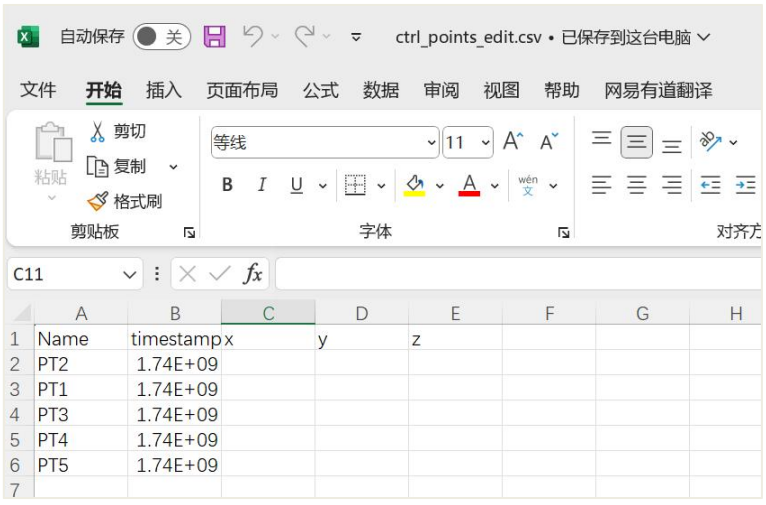


Fig 6-25 Control Point Template File

Edit the control point template according to actual conditions, mainly by filling in the x/y/z fields. After editing, save the file as **CSV**. A sample edited result is shown below.

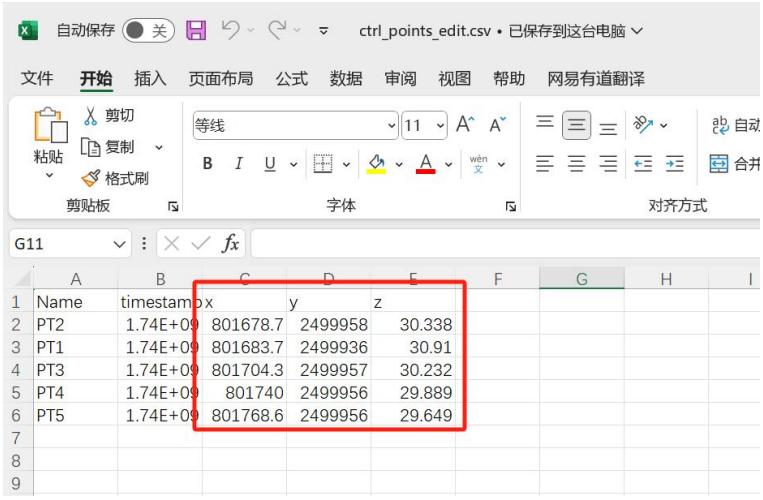


Fig 6-26 Edited Control Point File

Import the control point file. In the Control Point Calibration panel, click + to import the control point file edited in the previous step. The file format must be **CSV**.

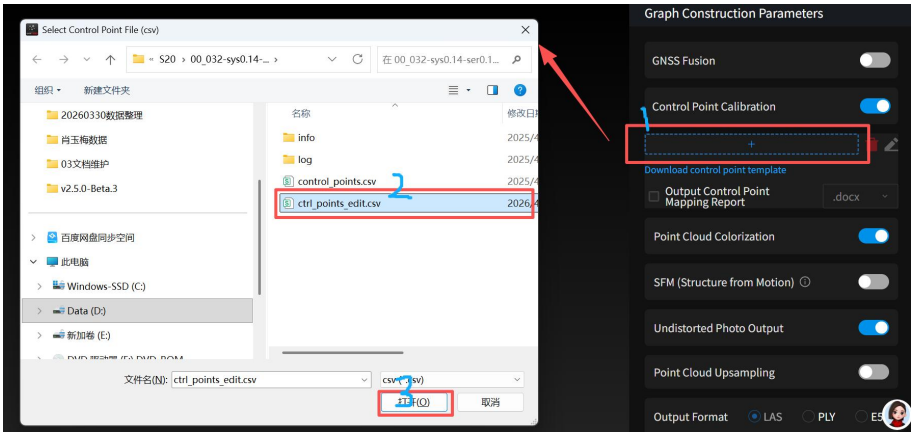


Fig 6-27 Importing a Control Point File

For imported control points, click **Edit** to view and edit the control point file within the software.



Fig 6-28 Edit Control Points Button

Edit control points. Click the **Edit Control Points** button to open the **Edit Control Points** dialog box. In this window, you can view and edit control points, directly modify the x/y/z values, or delete a control point record. You can also preview the control points in the lower panel.

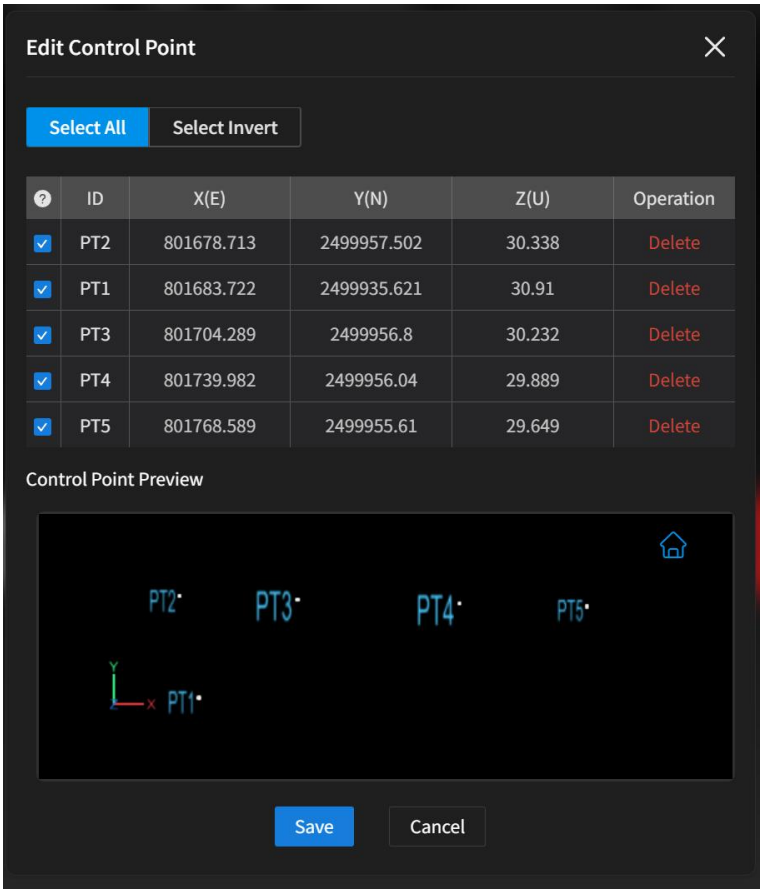


Fig 6-29 Edit Control Points Dialog Box

By default, all control point records are selected. You can check only the control points needed for **Control Point Calibration**. Click **Save** to save the current changes and return to the previous page.

6.2.2.3.2. Output Control Point Mapping Report

After **Control Point Calibration** is enabled and configured, you can also select **Output Control Point Mapping Report**. After point cloud reconstruction succeeds, the result folder will contain the corresponding report file.

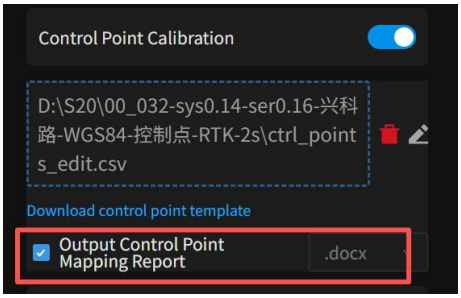


Fig 6-30 Output Control Point Mapping Report Parameter



Fig 6-31 Control Point Mapping Report File

6.2.2.4. Output Results

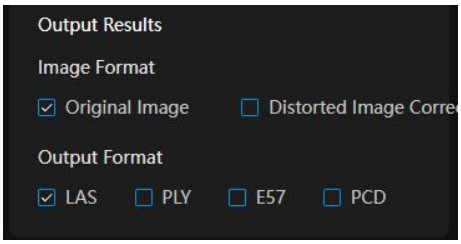


Fig 6-32 Output Results

Image format: By default, only **Original Photos** is selected (required). If **Distorted Image Correction** is also selected, the reconstructed result folder will contain the corresponding undistorted images, which can be used for third-party oblique modeling and similar workflows.

Note: If you want to use the point cloud generated after mapping for 3DGS reconstruction, this parameter must be enabled.

Output format: **LAS** is selected by default. Output in **LAS**, **PCD**, **PLY**, and **E57** formats is supported.

6.2.3. 3DGS Parameter Description

These parameters are mainly used to configure 3DGS reconstruction tasks, including processing preference and number of iterations. After configuration is complete, 3DGS reconstruction can be started.

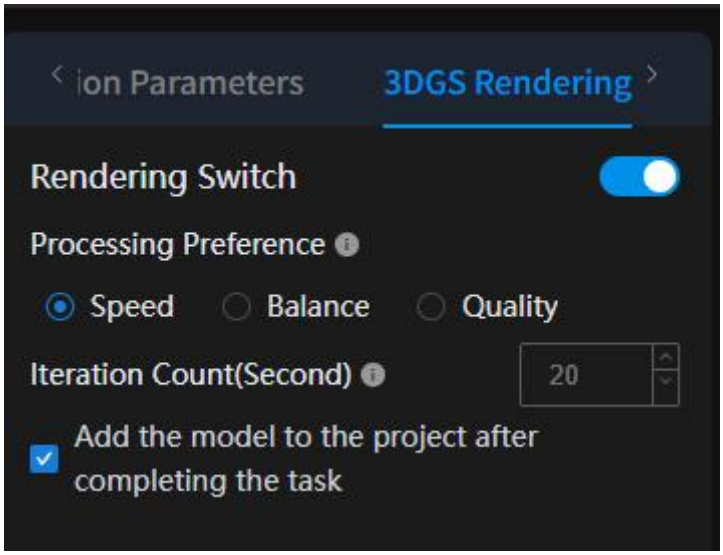


Fig 6-33 3DGS Parameters

The parameters are described below:

Processing Preference: The default is **Speed**, and it can be switched to **Balanced** or **Quality**. Users can choose the appropriate option according to their computer configuration. The latter can significantly improve the quality of the reconstructed 3DGS model, but it also increases reconstruction time considerably.

Iterations: The default is 20, and users may adjust it manually. Increasing the iteration count appropriately can improve visual detail and convergence, but it does not imply higher measurement accuracy. 3DGS is intended mainly for photorealistic viewing and site documentation. Use point cloud data for dimensional measurement, accuracy checks, and CAD drafting.

Add to Project After Task Completion: Selected by default, but can be cleared. If selected, a successfully reconstructed 3DGS model is automatically added to the data results tree.

6.2.4. Apply Parameters to All Tasks

Click **Apply** to apply the current task's parameter settings to other tasks in the same project.



Fig 6-34 Applying Mapping Parameters

Chapter 7. Project Browsing

After a project has completed point cloud reconstruction or 3DGS reconstruction, you can open the **Project Browsing** interface to view and analyze the reconstructed point cloud or 3DGS model.

On the main interface, double-click the corresponding project in the [**Project Management**] panel, or click **Open Project**, to enter the **Project Browsing** interface.

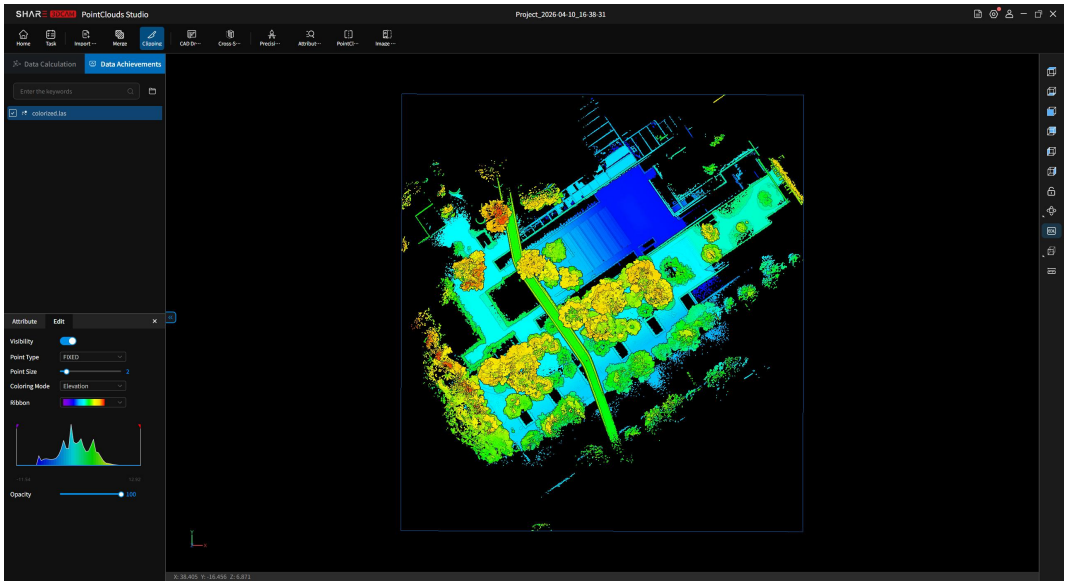


Fig 7-1 Project Browsing Interface

7.1. [Data Management] Panel

7.1.1. Overview

The [**Data Management**] panel uses a tree structure to manage the results generated after project mapping, as well as analysis and measurement data. It includes point clouds, 3D Gaussian layers, measurement records, and other modeling results such as photo points and trajectories. The panel supports real-time linkage between data layers and the [**Properties**] window, and also supports operations on layer groups and individual data layers.

Generated or imported results are attached under the corresponding parent file automatically: CAD drawings, annotations and cropped point clouds generated from a point cloud are placed under that point cloud; annotations and cropped models generated from 3DGS are placed under that 3DGS. Results generated with no file selected, and merged point clouds, are placed in the "Others" folder; measurement annotations are placed in the "Measurement" folder.

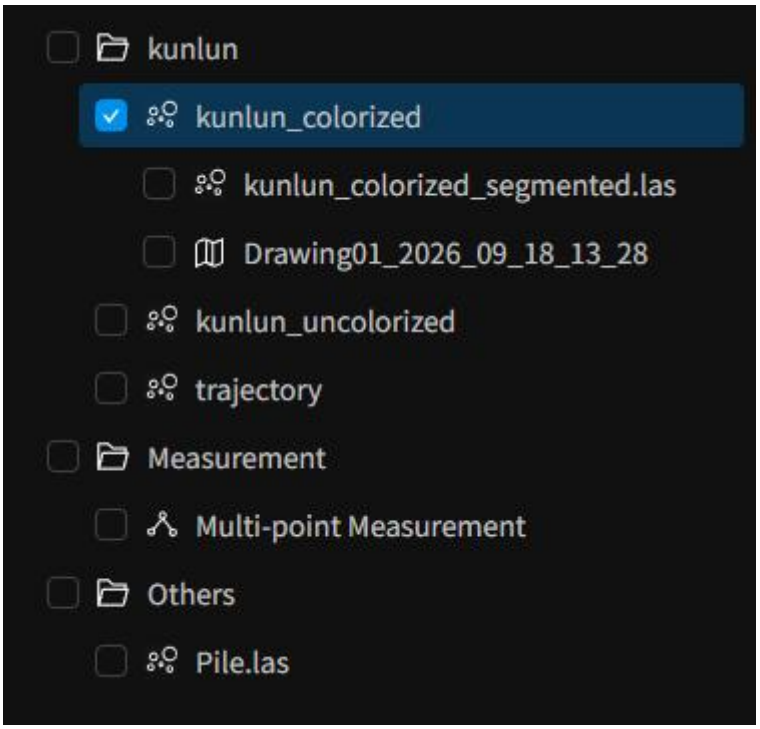


Fig 7-2 Data Management Panel

7.1.2. Search

Enter keywords in the search box at the top of the panel to filter layer groups or layers in the directory tree. Click × beside the search box to clear the search text.

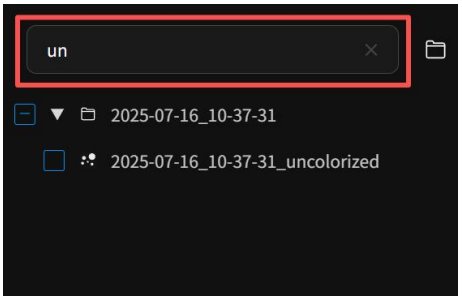


Fig 7-3 Data Search Box

7.1.3. Visible / Hidden

Click the visibility button in front of a layer group or layer in the [Data Management] panel to switch its visibility in the 3D scene. Toggling the visibility button of a layer group shows/hides all its child nodes together; toggling a single child node does not affect the parent node or other nodes.

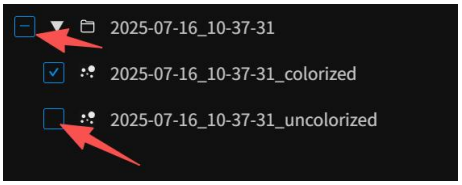


Fig 7-4 Visibility Toggle

7.1.4. Layer Group Operations

7.1.4.1. Create a New Layer Group

A layer group is a collection of layers. For easier management and control, you can create a layer group to manage multiple layers together. Click **Add Group** beside the search box to create a new layer group under the root directory.

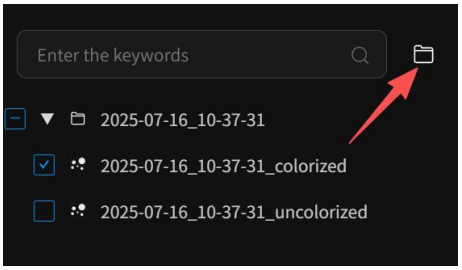


Fig 7-5 Creating a New Group

You can also move the pointer over the target layer group, select it, and choose **New Group** from the right-click menu to create a child layer group under that group.

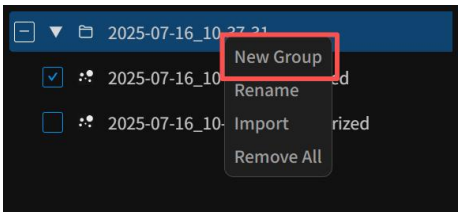


Fig 7-6 Creating a Child Layer Group

7.1.4.2. Rename a Layer Group

To rename an existing layer group, choose **Rename** from the right-click menu.

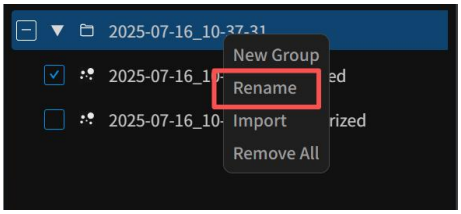


Fig 7-7 Renaming a Layer Group

7.1.4.3. Import Data

You can import point cloud data or a 3DGS model into the corresponding layer group. Supported point cloud formats are .las, .laz, .ply, and .pcd. ply-format 3DGS models are also supported. Move the pointer over the target layer group, select it, and choose Import from the right-click menu to add point cloud data under that group. The operation is the same as function Area Panel - Import Data. See that section for details. Import placement: with a model selected, imported CAD or 3D models are placed under that model; with a CAD, annotation or trajectory file selected, they are placed at the same level as that file; with nothing selected, they are placed in the "Others" folder. Import is unavailable in multi-select mode.

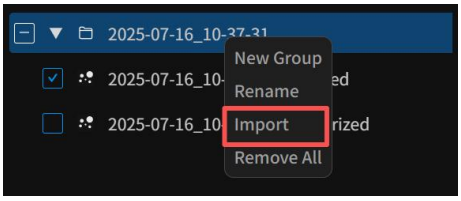


Fig 7-8 Import Data

7.1.4.4. Remove All (Data)

Removes all data under the selected layer group. Move the pointer over the target group, select it, and choose **Remove All** from the right-click menu.

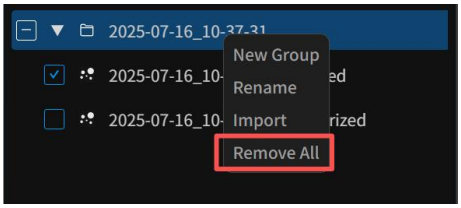


Fig 7-9 Remove All

After you click **Remove All**, a confirmation window appears. Click **OK** to execute the operation.

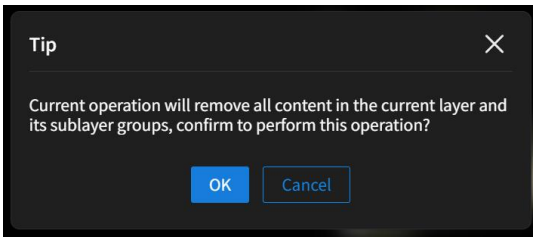


Fig 7-10 Confirmation Dialog

7.1.5. Layer Operations

7.1.5.1. Single Point Cloud Layer Operations

In the [**Data Management**] panel, a single point cloud layer supports selection, locating, restoring initial coordinates, renaming, opening its folder, exporting, removing, and viewing its properties.

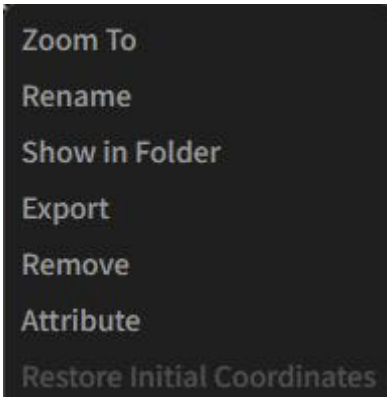


Fig 7-11 Point Cloud Layer Operations

7.1.5.1.1. Select a Point Cloud

Click a point cloud layer in the directory tree to select it. After it is selected, the layer is highlighted in the [**Data Management**] panel, and a bounding box for the selected data is displayed in the 3D scene.

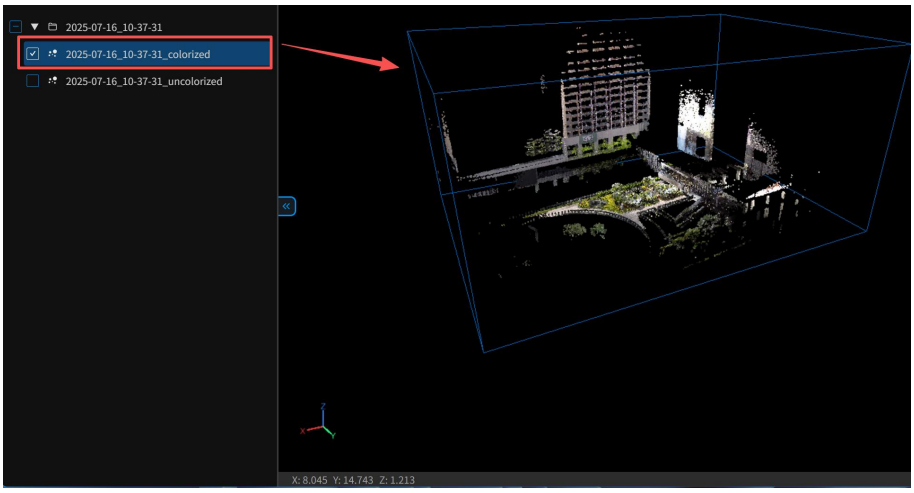


Fig 7-12 Selecting a Point Cloud

Click the point cloud layer again, or click a blank area in the [**Data Management**] panel, to clear the selection.

7.1.5.1.2. Zoom To

Move the pointer over the target layer, select it, then choose Zoom To from the right-click menu. The 3D view switches to a top view above the selected point cloud's bounding box, then centers and fits the entire point cloud.

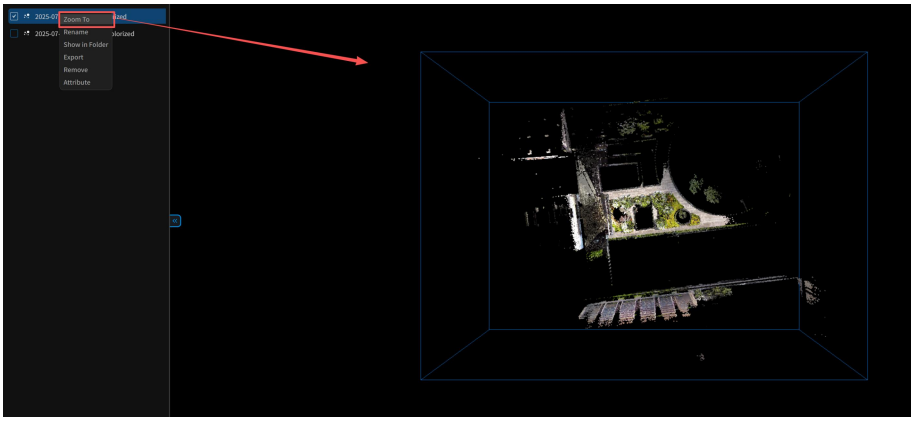


Fig 7-13 Locating a Point Cloud

7.1.5.1.3. Restore Initial Coordinates

After moving or rotating the point cloud layer and saving the change, exit Move and Rotate mode. In the [Data Management] results tree, right-click the layer and choose Restore Initial Coordinates. This command is unavailable until a move/rotation transform has been saved. It clears all previously saved move/rotation transforms for that file and returns it to its original coordinates. Other results in the same solve group are not restored automatically; restore each one separately if needed. This differs from Reset in the Move and Rotate tool group, which only undoes the current adjustment.

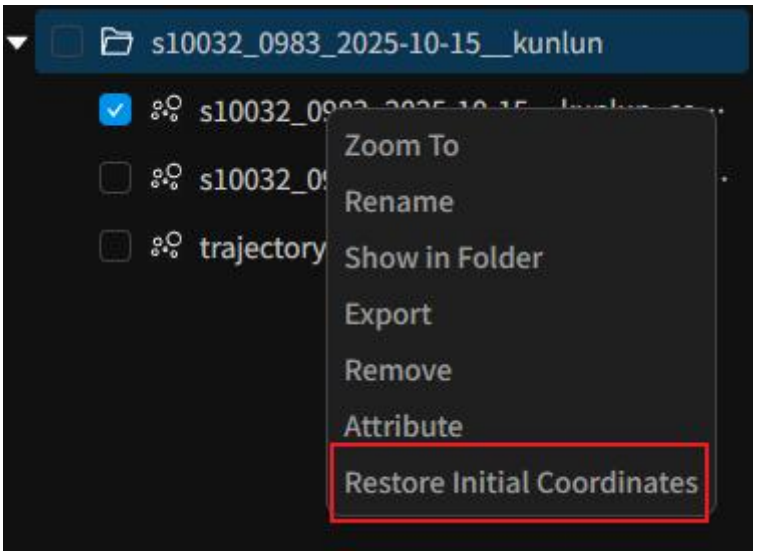


Fig 7-14 Restoring Initial Coordinates for a Point Cloud

7.1.5.1.4. Rename

Move the pointer over the target layer, select it, and choose Rename from the right-click menu to rename the point cloud.

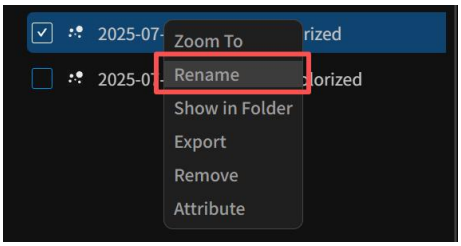


Fig 7-15 Renaming a Point Cloud

7.1.5.1.5. Open Containing Folder

Move the pointer over the target layer, select it, and choose Open Containing Folder from the right-click menu to view the location of the point cloud on the computer.

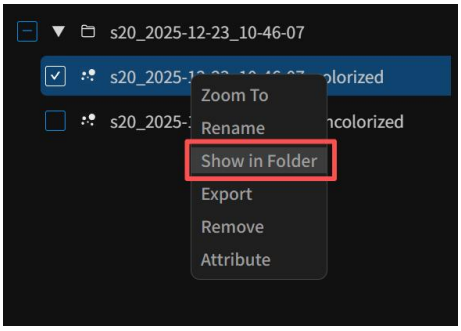


Fig 7-16 Open Containing Folder

7.1.5.1.6. Export

Supports exporting point cloud data for easy integration with third-party software. Supports exporting in formats such as LAS1.4, LAS1.3, LAS1.2, PLY, PCD, E57, and RCS.

Move the pointer over the target layer, select it, and choose **Export** from the right-click menu to export the point cloud.

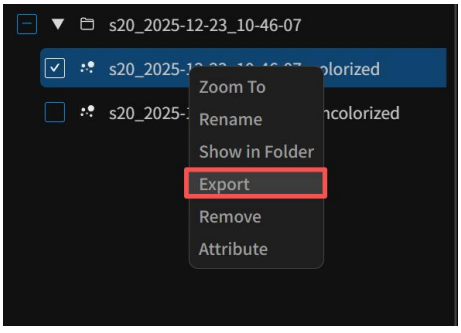


Fig 7-17 Point Cloud Export Option

In the dialog box that appears, set the point cloud format, export name, and storage path. These parameters may also be left at their default values. Click **OK** to perform the export.

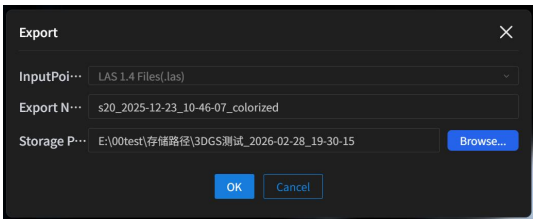


Fig 7-18 Single Point Cloud Export Dialog

7.1.5.1.7. Remove

Move the pointer over the target layer, select it, and choose Remove from the right-click menu to remove the point cloud.

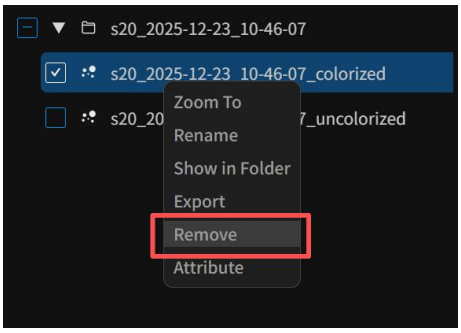


Fig 7-19 Removing a Point Cloud

After you click Remove, a confirmation dialog appears. Click **OK** to execute the operation.

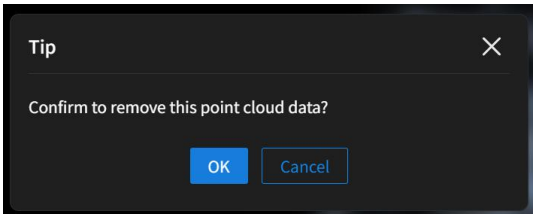


Fig 7-20 Removal Tip

7.1.5.1.8. Properties

By default, the [**Properties**] panel is open. Select the layer to view its properties. See the [**Properties**] panel section for details.

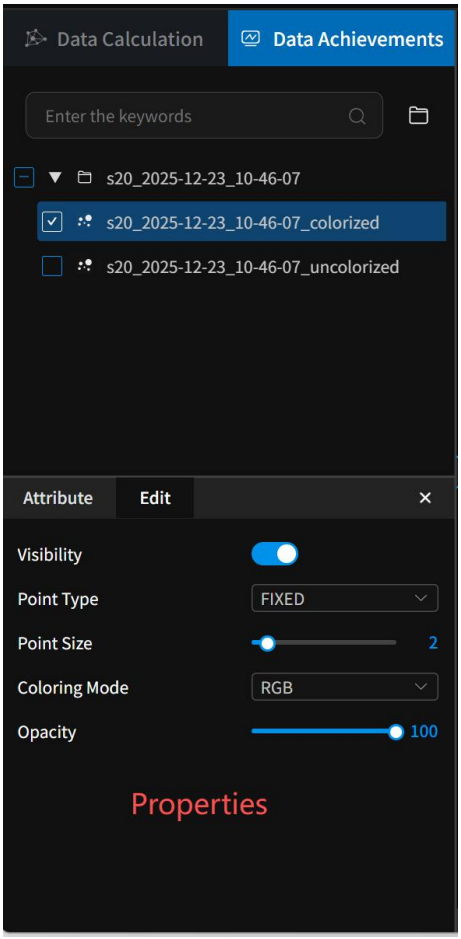


Fig 7-21 Viewing Point Cloud Properties

If the properties window has been closed, move the pointer over the target layer, select it, and choose Properties from the right-click menu to open the point cloud properties panel.

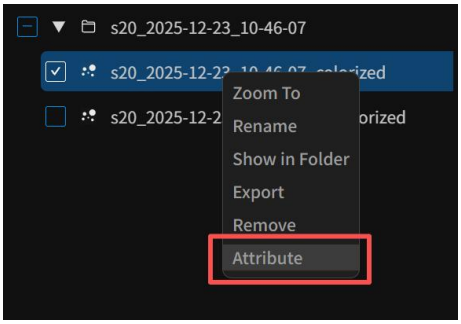


Fig 7-22 Opening the Properties Panel

7.1.5.2. Multiple Point Cloud Layer Operations

In the [Data Management] panel, you can hold down Ctrl to select multiple point cloud layers. Operations such as locate and remove are supported.

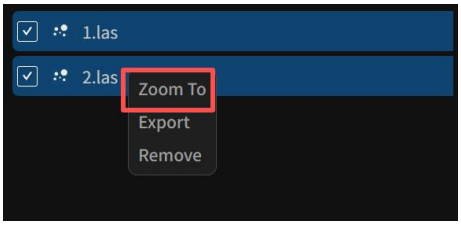


Fig 7-23 Multi-Layer Operations

7.1.5.2.1. Select Multiple Point Clouds

In the [**Data Management**] directory tree, hold down Ctrl and click to select multiple point cloud layers. Click a selected layer again to cancel its selection. After selection, the selected layers are highlighted in the directory tree, and a combined bounding box is generated in the scene based on the spatial locations of the selected point clouds.

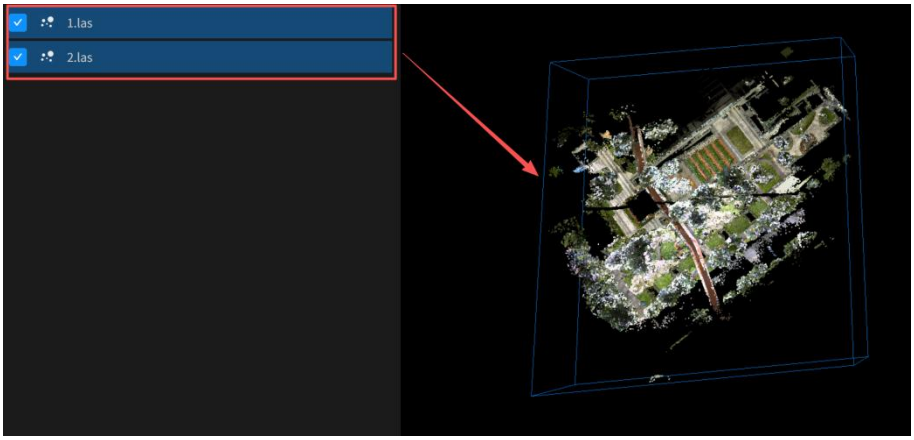


Fig 7-24 Selecting Multiple Point Clouds

7.1.5.2.2. Zoom To

Select multiple point cloud layers in the directory tree, then choose Zoom To from the right-click menu. The selected point clouds are centered and fully displayed in the 3D scene.

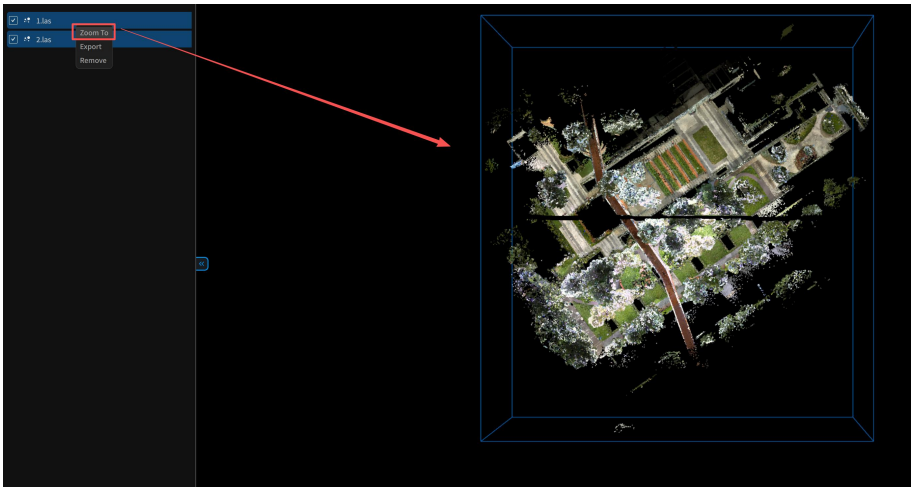


Fig 7-25 Locating Multiple Point Clouds

Note: If the selected point clouds are far apart in space, the point cloud data may not be visible after locating them.

7.1.5.2.3. Remove

Select multiple point cloud layers in the directory tree, then choose Remove from the right-click menu to remove the selected point clouds.

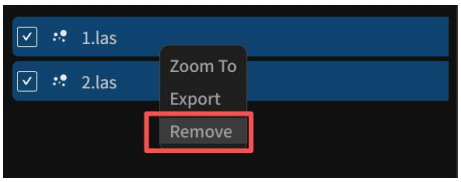


Fig 7-26 Removing Multiple Point Clouds

7.1.5.3. Single 3D Gaussian Layer Operations

In the [Data Management] panel, a 3D Gaussian layer supports selection, locating, restoring initial coordinates, renaming, showing/hiding the skybox, removing, and viewing its properties.

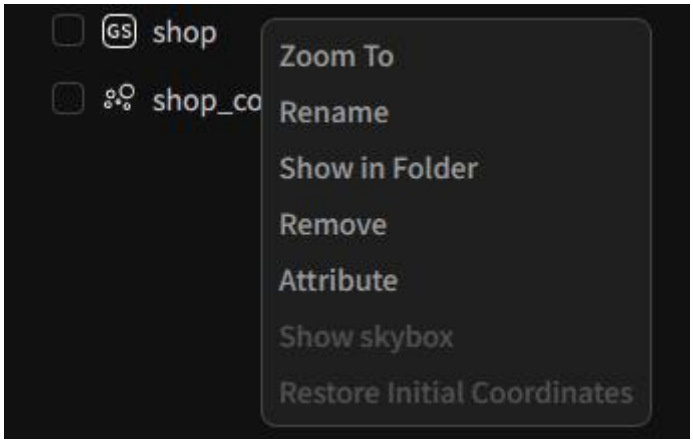


Fig 7-27 3D Gaussian Layer Operations

7.1.5.3.1. Select a 3D Gaussian Layer

Click a 3D Gaussian layer in the directory tree to select it. After it is selected, the layer is highlighted in the [**Data Management**] panel.

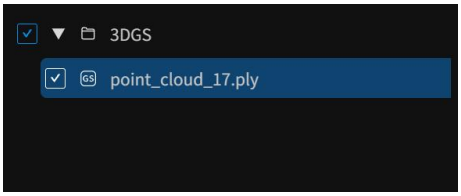


Fig 7-28 Selecting a 3D Gaussian Layer

Click the point cloud layer again, or click a blank area in the [Data Management] panel, to clear the selection.

7.1.5.3.2. Zoom To

Move the pointer over the target layer, select it, and choose Zoom To from the right-click menu to jump to the starting position of the 3D Gaussian layer.



Fig 7-29 Locating a 3D Gaussian Layer

7.1.5.3.3. Restore Initial Coordinates

After moving or rotating the 3D Gaussian layer and saving the change, exit Move and Rotate mode. In the [Data Management] results tree, right-click the layer and choose Restore Initial Coordinates. This command is unavailable until a move/rotation transform has been saved. It clears all previously saved move/rotation transforms for that file and returns it to its original coordinates. Other results in the same solve group are not restored automatically; restore each one separately if needed. This differs from Reset in the Move and Rotate tool group, which only undoes the current adjustment.

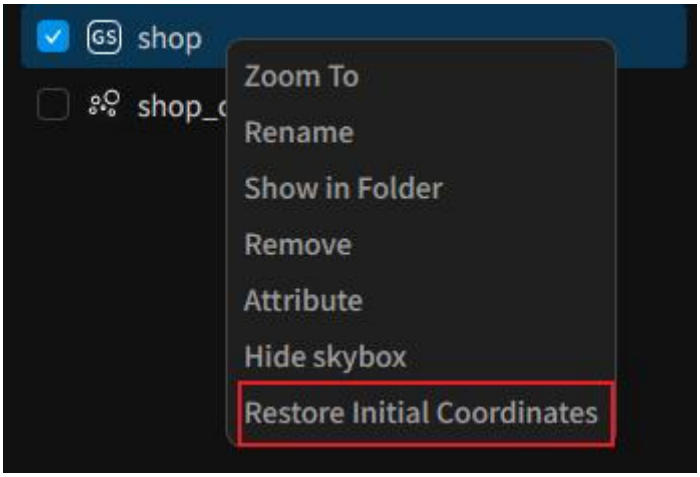


Fig 7-30 Restoring Initial Coordinates for a 3D Gaussian Layer

7.1.5.3.4. Rename

Move the pointer over the target layer, select it, and choose Rename from the right-click menu to rename the 3D Gaussian layer.

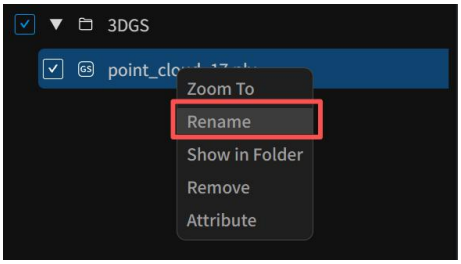


Fig 7-31 Renaming a 3D Gaussian Layer

7.1.5.3.5. Open Containing Folder

Move the pointer over the target layer, select it, and choose Open Containing Folder from the right-click menu to view the location of the 3D Gaussian layer on the computer.

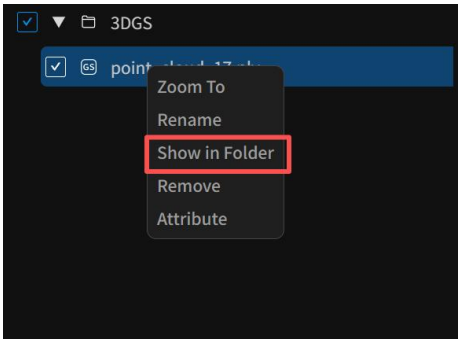


Fig 7-32 Open Containing Folder

7.1.5.3.6. Show or Hide the Skybox

Select the target 3DGS layer, then choose "Hide skybox" or "Show skybox" from its right-click menu, depending on the current state. Hiding the skybox makes the 3DGS model easier to inspect.

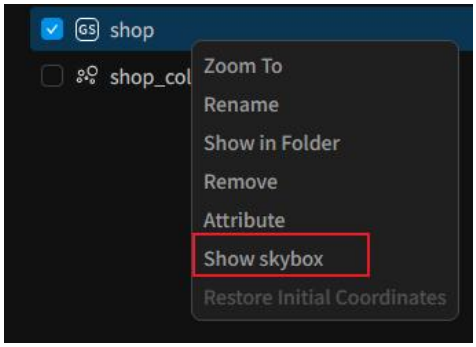


Fig 7-33 Show or Hide the Skybox

7.1.5.3.7. Remove

Move the pointer over the target layer, select it, and choose Remove from the right-click menu to remove the 3D Gaussian layer.

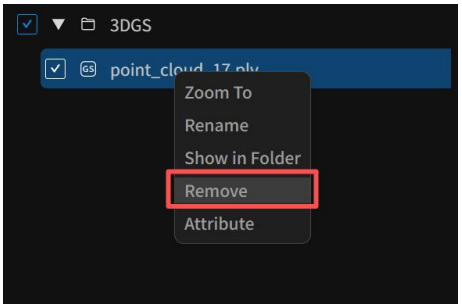


Fig 7-34 Removing a 3D Gaussian Layer

After you click Remove, a confirmation dialog appears. Click **OK** to execute the operation.

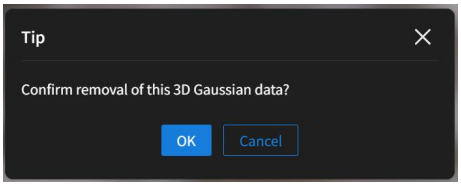


Fig 7-35 Removal Confirmation

7.1.5.3.8. Properties

By default, the [**Properties**] panel is open. Select the layer to view its properties. See the [**Properties**] panel section for details.

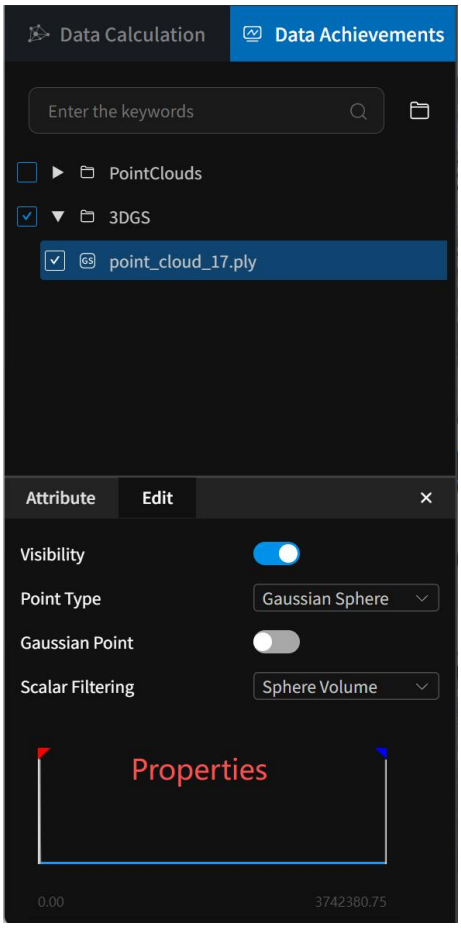


Fig 7-36 Viewing Point Cloud Properties

If the properties window has been closed, move the pointer over the target layer, select it, and choose Properties from the right-click menu to open the 3D Gaussian properties panel.

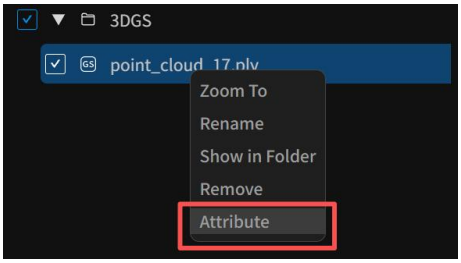


Fig 7-37 Viewing the Properties Panel

7.1.5.4. Multiple 3D Gaussian Layer Operations

7.1.5.4.1. Select Multiple Gaussian Layers

In the [**Data Management**] panel, you can hold down Ctrl to select multiple 3D Gaussian layers. Operations such as remove are supported.

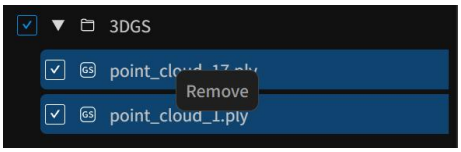


Fig 7-38 Multi-Layer Operations

7.1.5.4.2. Remove

Select multiple 3D Gaussian layers in the directory tree, then choose Remove from the right-click menu to remove the selected 3D Gaussian layers.

7.1.5.5. Single Measurement Layer Operations

In the [**Data Management**] panel, a measurement layer supports selection, locating, renaming, exporting, removing, and viewing its properties.

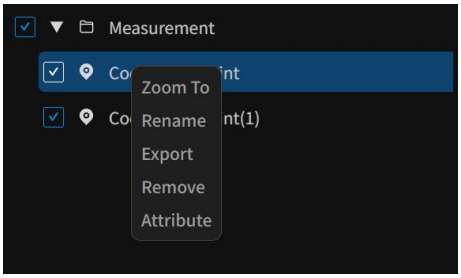


Fig 7-39 Measurement Layer Operations

7.1.5.5.1. Select a Measurement Layer

Click a measurement layer in the directory tree to select it. After the point cloud is selected, it is highlighted in the [Data Management] panel, and the selected point cloud displays a bounding box for the data in the 3D scene.

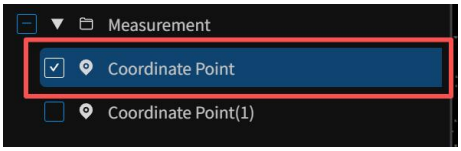


Fig 7-40 Selecting a Measurement Layer

Click the point cloud layer again, or click a blank area in the [Data Management] panel, to clear the selection.

7.1.5.5.2. Zoom To

Move the pointer over the target layer, select it, and choose **Zoom To** from the right-click menu to jump to the position of the measurement layer.

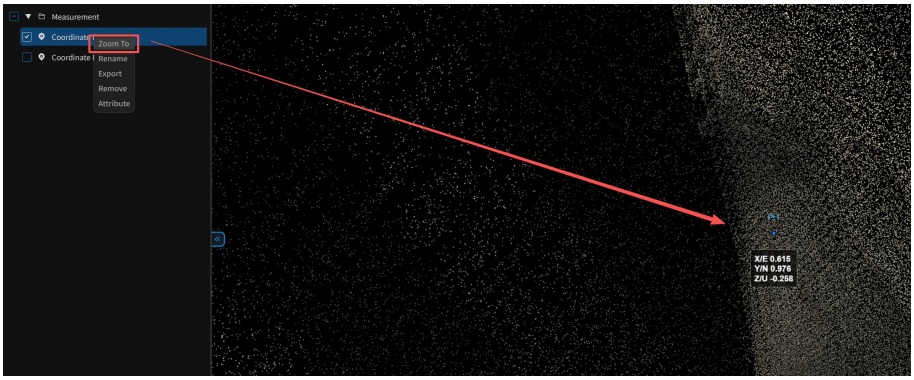


Fig 7-41 Locating a Layer

7.1.5.5.3. Rename

Move the pointer over the target layer, select it, and choose **Rename** from the right-click menu to rename the measurement layer.

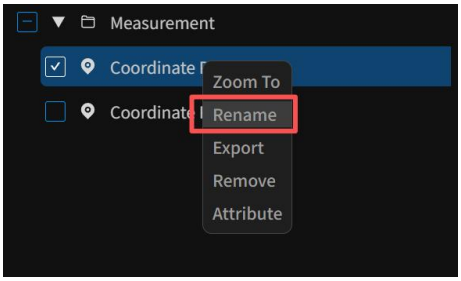


Fig 7-42 Renaming a Measurement Layer

7.1.5.5.4. Export

Move the pointer over the target layer, select it, and choose **Export** from the right-click menu to export the measurement layer.

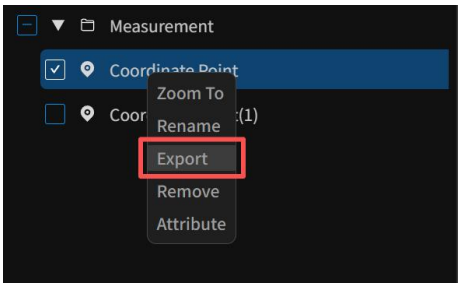


Fig 7-43 Measurement Layer Export Option

In the dialog box that appears, optionally enter the name of the layer to be exported (the default is the same as in the directory tree), then click **OK**.

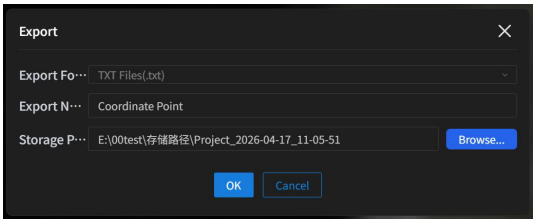


Fig 7-44 Measurement Layer Export Dialog

7.1.5.5.5. Remove

Move the pointer over the target layer, select it, and choose **Remove** from the right-click menu to remove the layer.

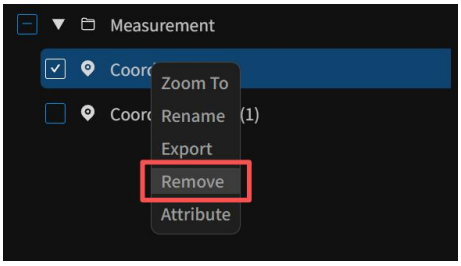


Fig 7-45 Removing a Measurement Layer

7.1.5.5.6. Properties

By default, the [**Properties**] panel is open. Select the layer to view its properties. See the [**Properties**] panel section for details.

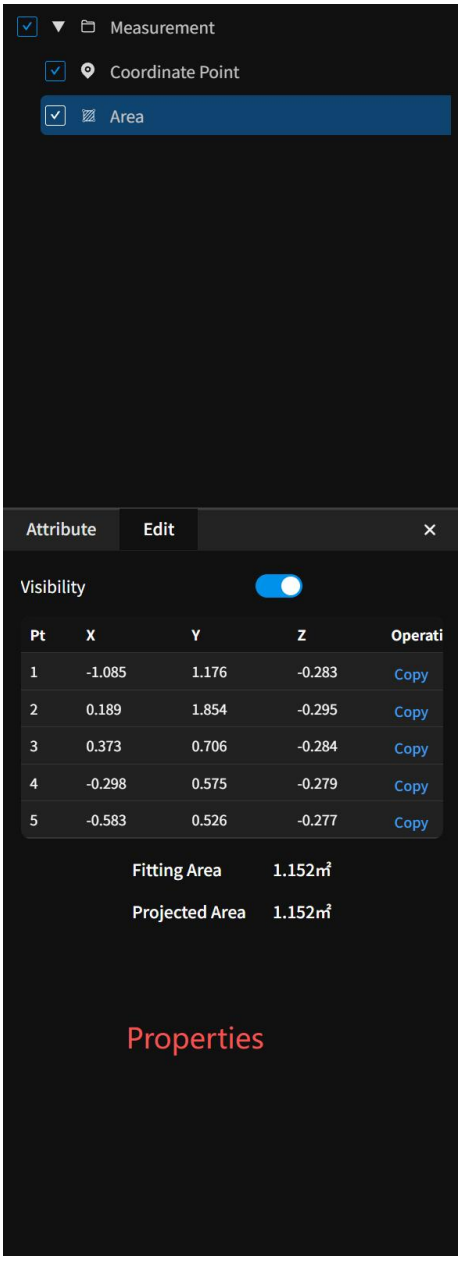


Fig 7-46 Measurement Layer Properties Panel

If the properties window has been closed, move the pointer over the target layer, select it, and choose Properties from the right-click menu to open the measurement layer properties panel.

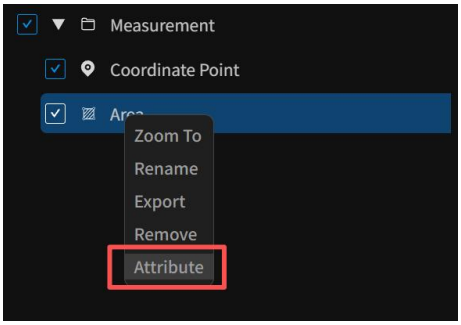


Fig 7-47 Opening the Measurement Layer Properties Panel

7.1.5.6. Multiple Measurement Layer Operations

In the [Data Management] panel, you can hold down Ctrl to select multiple measurement layers. Operations such as locate and remove are supported.

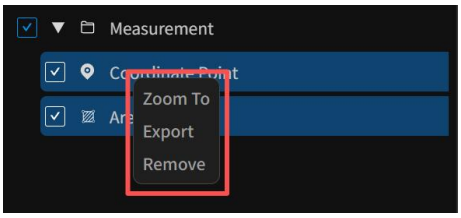


Fig 7-48 Selecting Multiple Measurement Layers

7.1.5.6.1. Select Multiple Measurement Layers

This is the same as multi-selecting point cloud layers. See **Select Multiple Point Clouds**.

7.1.5.6.2. Zoom To

This is the same as the point cloud layer locate operation. See **Locate (Select Multiple Point Clouds)**.

7.1.5.6.3. Remove

This is the same as the point cloud layer remove operation. See Remove (Select Multiple Point Clouds).

7.1.5.7. Single Vector Layer Operations

In the [**Data Management**] panel, a vector layer supports selection, renaming, exporting, removing, and viewing its properties.

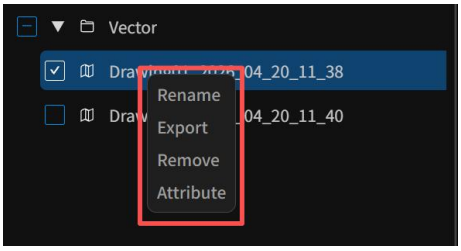


Fig 7-49 Vector Layer Operations

7.1.5.7.1. Select a Vector Layer

Click a measurement layer in the directory tree to select it. After the point cloud is selected, the row background is highlighted in the [Data Management] panel.

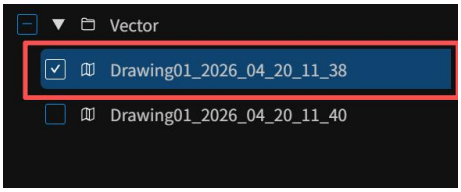


Fig 7-50 Selecting a Vector Layer

7.1.5.7.2. Rename

Move the pointer over the target layer, select it, and choose **Rename** from the right-click menu to rename the vector layer.

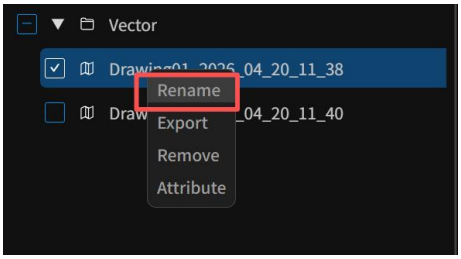


Fig 7-51 Renaming a Vector Layer

7.1.5.7.3. Export

Move the pointer over the target layer, select it, and choose **Export** from the right-click menu to export the vector layer.

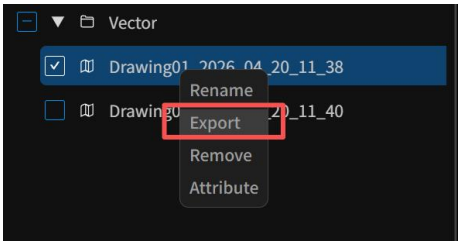


Fig 7-52 Vector Layer Export Operation

In the dialog box that appears, optionally enter the export format, name (the default is the same as in the directory tree), and save path, then click **OK**.

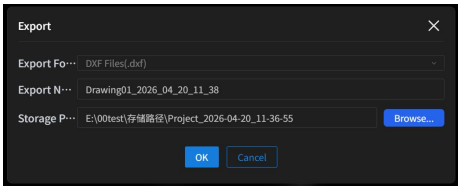


Fig 7-53 Vector Export Dialog

7.1.5.7.4. Remove

Move the pointer over the target layer, select it, and choose **Remove** from the right-click menu to remove the vector layer.

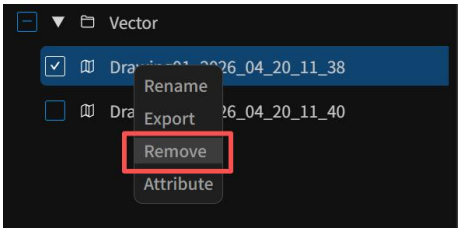


Fig 7-54 Removing a Vector Layer

7.1.5.7.5. Properties

By default, the [**Properties**] panel is open. Select the layer to view its properties. See the [**Properties**] panel section for details.

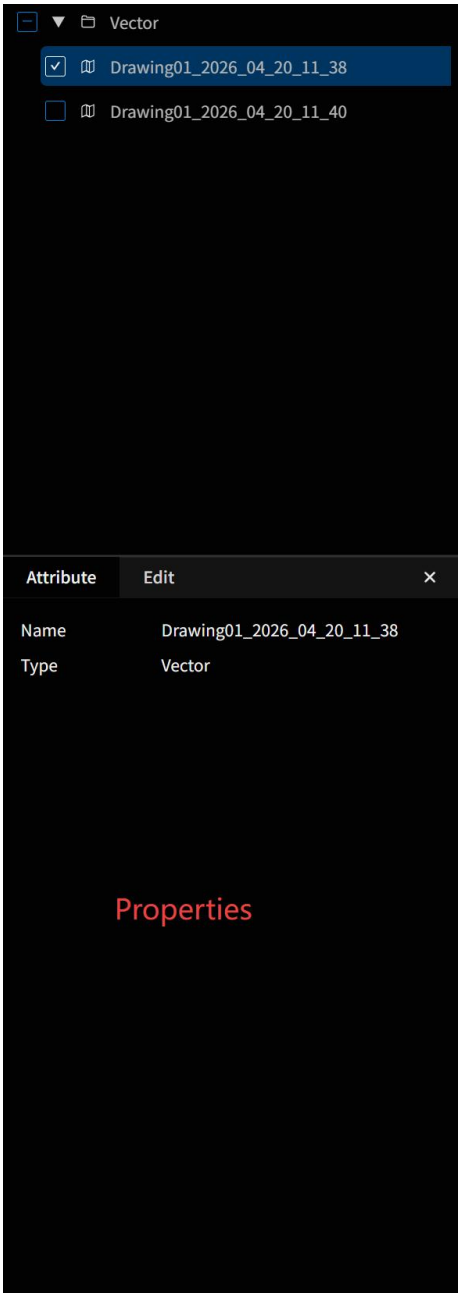


Fig 7-55 Vector Layer Properties Panel

If the properties window has been closed, move the pointer over the target layer, select it, and choose **Properties** from the right-click menu to open the vector layer properties panel.

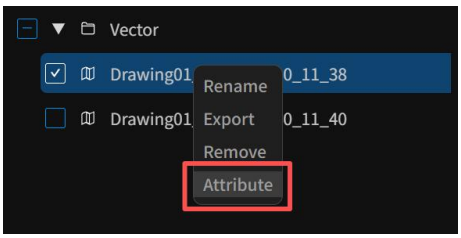


Fig 7-56 Opening the Vector Layer Properties Panel

7.1.5.8. Multiple Vector Layer Operations

In the [Data Management] panel, you can hold down Ctrl to select multiple vector layers. Remove operations are supported.

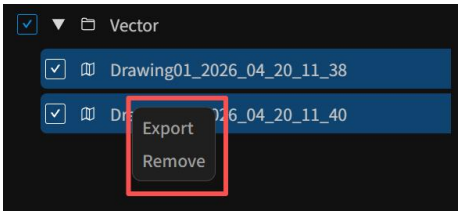


Fig 7-57 Selecting Multiple Vector Layers

7.1.5.8.1. Select Multiple Vector Layers

This is the same as multi-selecting point cloud layers. See **Select Multiple Point Clouds**.

7.1.5.8.2. Remove

This is the same as the point cloud layer remove operation. See Remove (Select Multiple Point Clouds).

7.1.6. Sorting

Click and hold a layer group or layer with the mouse, drag it to the desired position, and release the mouse to change the order and hierarchy of layer groups or layers. Dragging a parent node moves all its child nodes with it; dropping a file between two nodes only changes the sibling order; dropping it onto a node moves it under that node (CAD drawings and annotations cannot serve as parent nodes). Multi-select dragging is limited to files at the same level.



Fig 7-58 Changing Layer Position

7.2. [Properties] Panel

7.2.1. Overview

The [**Properties**] panel is located below the [**Data Management**] panel. It is used to display layer property information and also supports modifying some layer properties, such as point cloud size, rendering mode, and transparency. Different types of data display different content in the [**Properties**] panel.

Select a layer to view its property information.

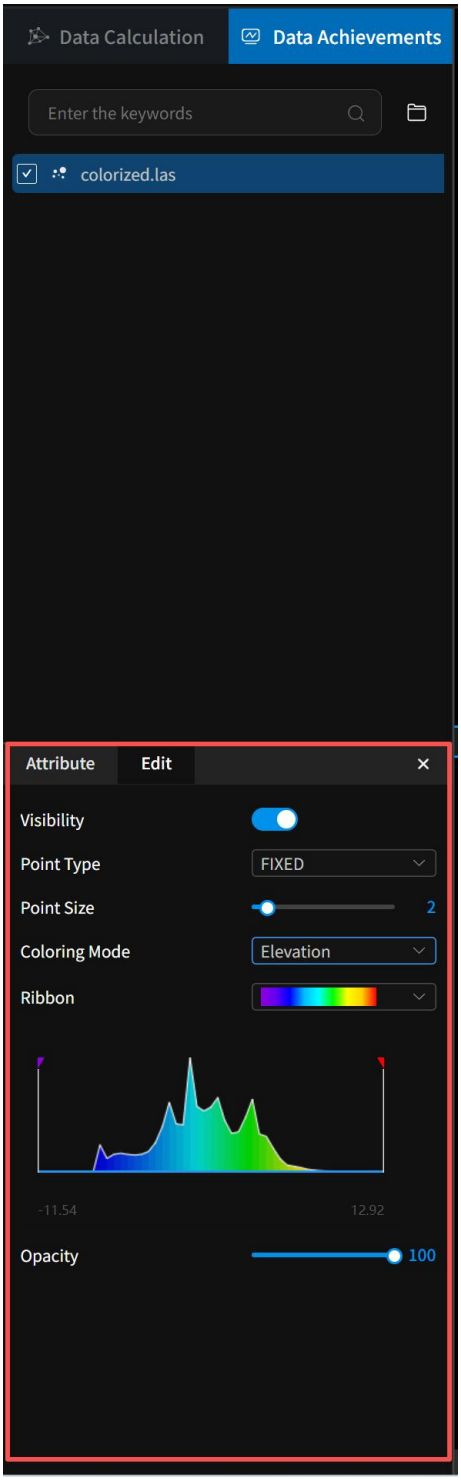


Fig 7-59 Properties Panel

By default, the [**Properties**] panel is open. Click × in the upper-right corner of the panel to close it. After it is closed, you can select a layer in the **Data Management** panel and click **Properties** on the right to open and view the layer properties.

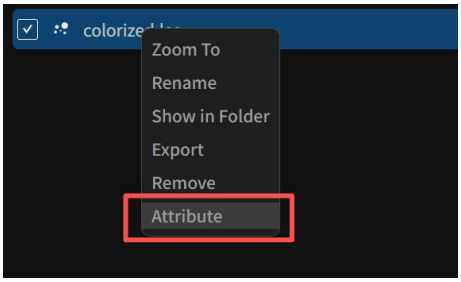


Fig 7-60 Opening the Properties Panel

7.2.2. Point Cloud Layer Properties

Select the corresponding point cloud in the [**Data Management**] panel to view its properties in the [**Properties**] panel.

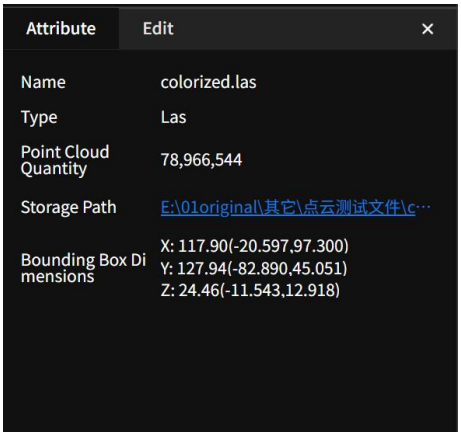


Fig 7-61 Point Cloud Properties (Basic Attributes)

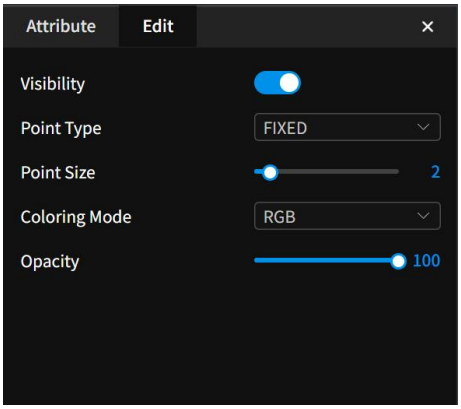


Fig 7-62 Point Cloud Properties (Editable Attributes)

The point cloud layer properties are described below:

• Storage Path: The folder containing the current point cloud. Click it to open the folder.

• Point Count: The total number of points in the current point cloud file.

• Bounding Box Size: Displays the size and position information of the point cloud bounding box.

• Point Type: The default is Fixed size, and it can be changed to **Adaptive**. When **Fixed** is used, the point size does not change when the scene is zoomed. When **Adaptive** is used, the point size changes together with the zoom level.

• Point Size: Controls the rendered size of the point cloud in the 3D scene. The default is 1. You can drag the slider to change the point size.

• Rendering Mode: Controls how the point cloud is rendered in the 3D scene. Six rendering modes are supported: **RGB**, **Elevation**, **Intensity**, **Time**, Monochrome, and Semantic mode. The default is **RGB**. For **Elevation**, **Intensity**, and **Time**, you can adjust the display range using the histogram to increase contrast.

• Transparency: Controls the transparency of the point cloud. The default is opaque. You can drag the slider to change the transparency.

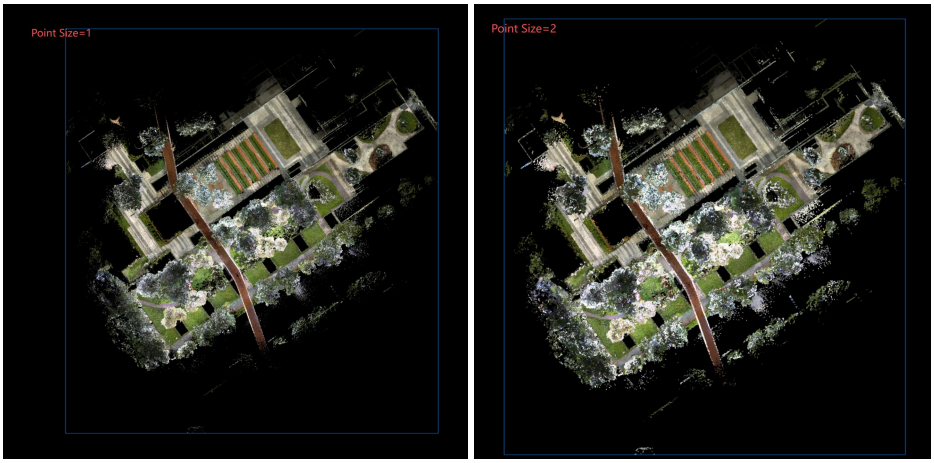


Fig 7-63 Rendering Effects with Different Point Sizes

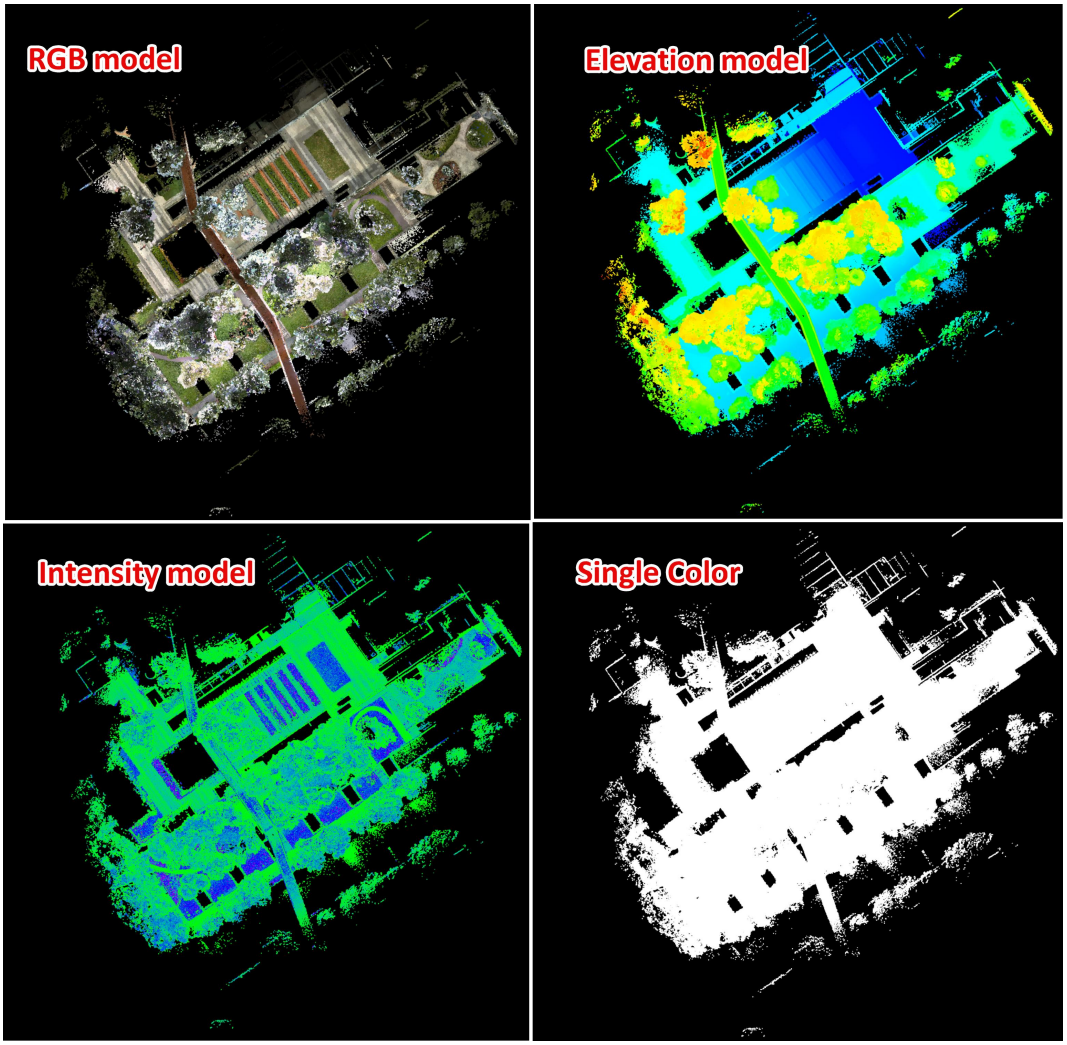


Fig 7-64 Point Cloud Effects in Different Rendering Modes

If the [**Properties**] panel is closed accidentally, move the pointer over the target layer and click Properties on the right side of the row to reopen it. See **Properties** under point cloud operations for details.

7.2.3. 3D Gaussian Layer Properties

Select the corresponding 3D Gaussian layer in the [**Data Management**] panel to view its properties in the [**Properties**] panel.

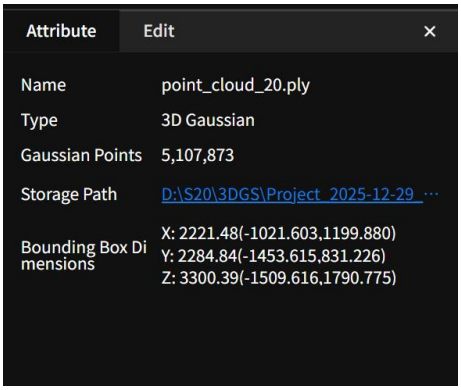


Fig 7-65 3D Gaussian Layer Properties (Basic Attributes)

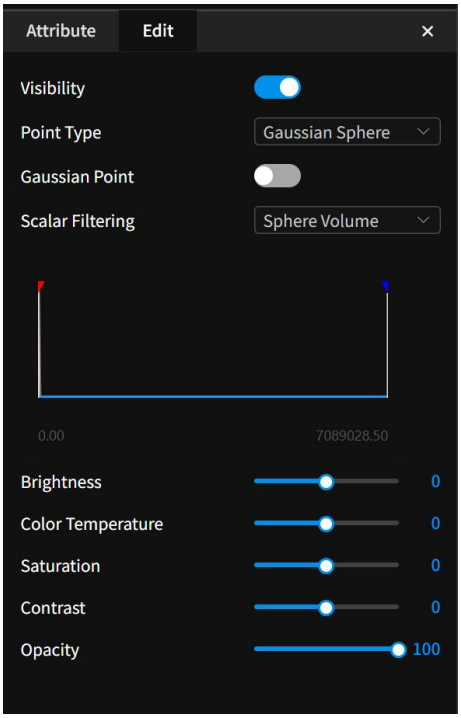


Fig 7-66 3D Gaussian Layer Properties (Editable Attributes)

The 3D Gaussian layer properties are described below:

• Gaussian Point Count: The number of points in the current 3D Gaussian model.

• Storage Path: The folder containing the current Gaussian model. Click it to open the folder.

• Bounding Box Size: Displays the size and position information of the 3D Gaussian model bounding box.

• Point Type: The default is Gaussian Sphere, and it can be changed to Fixed. When Fixed is selected, only Gaussian points are displayed in the scene, and point size, point color, and opacity can be adjusted.

• Gaussian Points: Disabled by default. When enabled, Gaussian points are overlaid on the Gaussian model.

• Scalar Filtering: Supports statistics on Gaussian points by sphere volume / surface area / brightness, etc. You can use the slider to filter out part of the Gaussian model.

• Brightness / Color Temperature / Saturation / Contrast: These parameters can be used to fine-tune the rendering effect of the 3D Gaussian model.

• Opacity: Controls the transparency of the point cloud. The default is opaque. You can drag the slider to change the transparency.

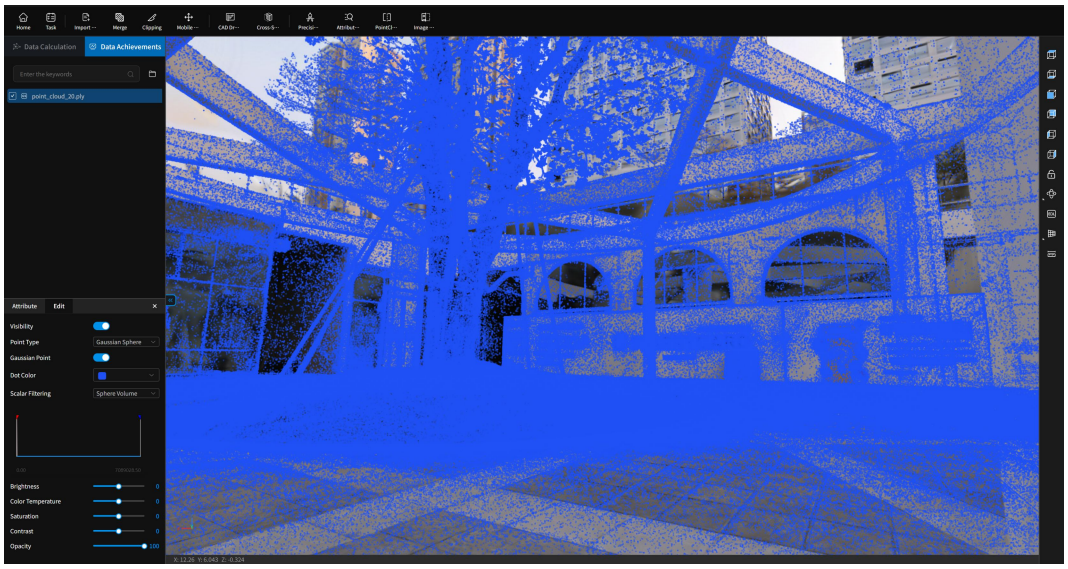


Fig 7-67 Enabling Gaussian Points

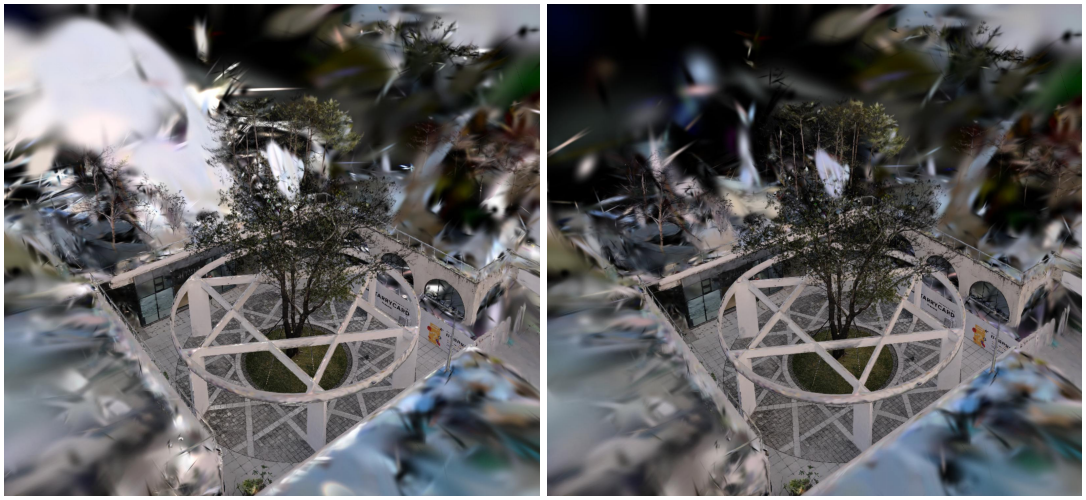


Fig 7-68 Scalar Filtering Effect (Brightness)

If the [**Properties**] panel is closed accidentally, move the pointer over the target layer and click **Properties** on the right side of the row to reopen it. See **Properties** under 3D Gaussian layer operations for details.

7.2.4. Measurement Layer Properties

Select the corresponding measurement layer in the [**Data Management**] panel to view its properties in the [**Properties**] panel.

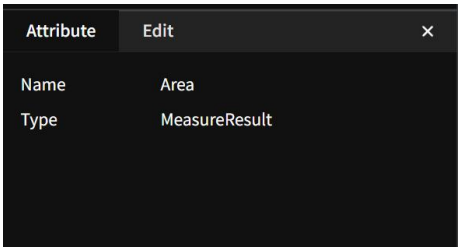


Fig 7-69 Measurement Layer Properties (Basic Attributes)

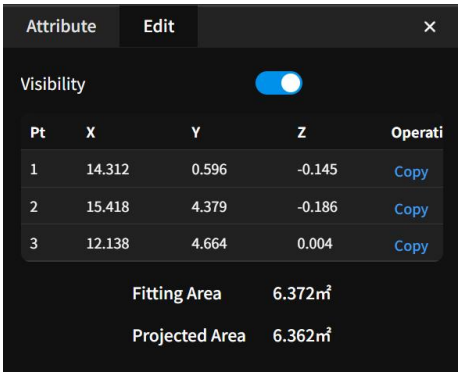


Fig 7-70 Measurement Layer Properties (Editable Attributes)

If the [**Properties**] panel is closed accidentally, move the pointer over the target layer and click **Properties** on the right side of the row to reopen it. See **Properties** under point cloud operations for details.

7.2.5. Vector Layer Properties

Select the corresponding vector layer in the [**Data Management**] panel to view its properties in the [**Properties**] panel.

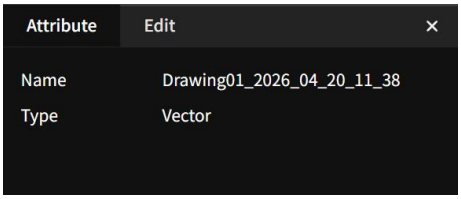


Fig 7-71 Vector Layer Properties

If the [**Properties**] panel is closed accidentally, move the pointer over the target layer and click **Properties** on the right side of the row to reopen it. See **Properties** under point cloud operations for details.

Chapter 8. 3D Scene Interaction

The 3D scene (or 3D viewport) is used for 3D rendering of data. It supports interaction with the scene through the mouse and also supports scene operations through the **View Toolbar**.

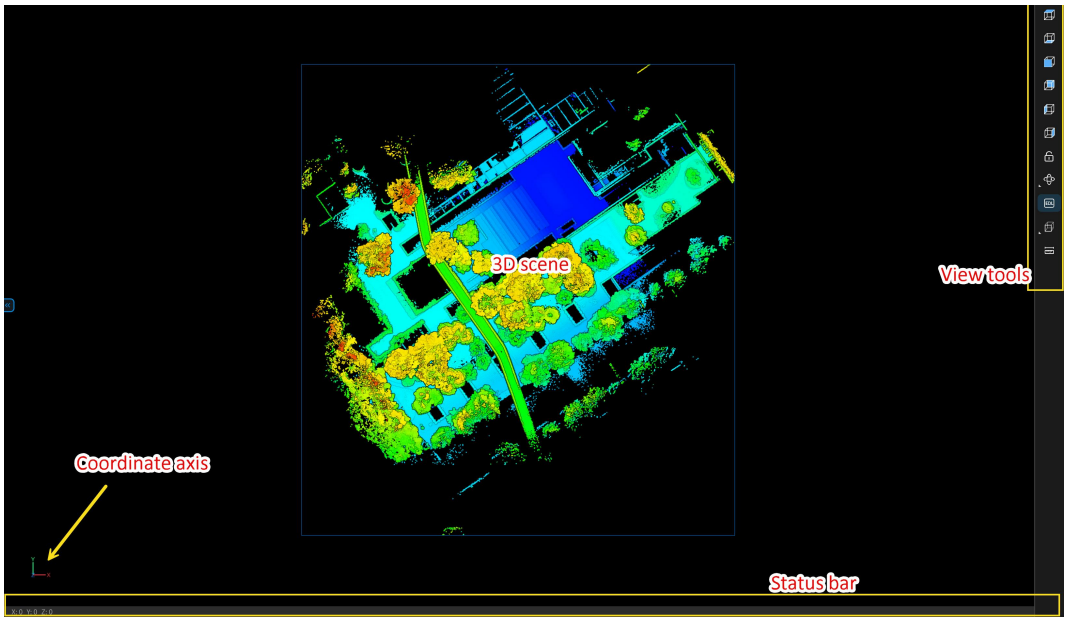


Fig 8-1 3D Scene

8.1. Mouse Interaction in the Scene

The mouse controls for scene operations are as follows:

Pan: Hold down the right mouse button and drag to pan the 3D scene.

Rotate: Hold down the left mouse button and drag to rotate the 3D scene.

Zoom: Scroll the mouse wheel to zoom the scene. The zoom center is the point picked by the mouse.

Move to center of view: **Double-click** the scene with the left mouse button to move the picked position to the center of the view.

Note: You can also use the **View Tools** to control the display of the 3D scene. See View Tools for details.

8.2. View Toolbar

The View Toolbar is located on the right side of the software. It provides a set of functions for operating the data displayed in the 3D scene.

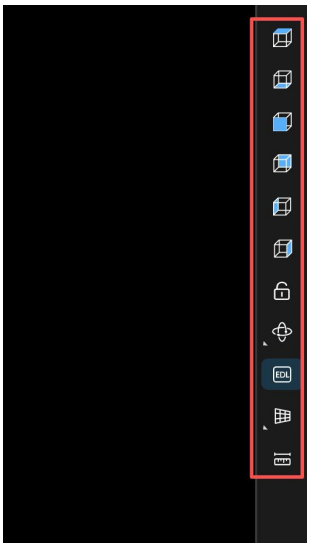


Fig 8-2 View Toolbar

8.2.1. Top / Bottom / Front / Back / Left / Right View

These controls move the camera to view the data in the 3D scene from different directions.

Top view: The camera looks down from +Z toward -Z.

Bottom view: The camera looks up from -Z toward +Z.

Front view: The camera looks from -Y toward +Y.

Back view: The camera looks from +Y toward -Y.

Left view: The camera looks from -X toward +X.

Right view: The camera looks from +X toward -X.

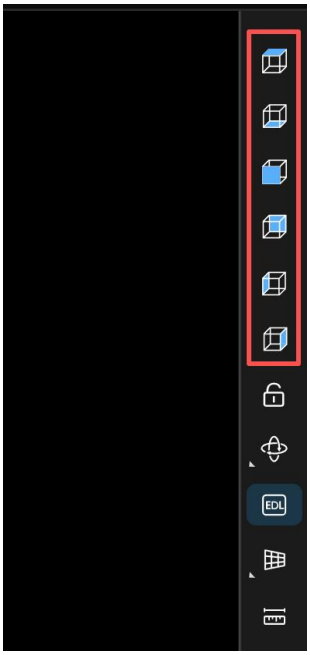


Fig 8-3 Top / Bottom / Front / Back / Left / Right Views

8.2.2. Lock / Unlock View

By default, the view is in the unlocked state. Click this button to switch it to the locked state. After the view is locked, the mouse can no longer rotate the scene, which is useful when viewing point cloud data from a specific orientation.

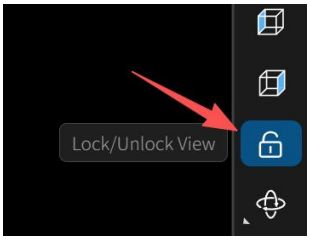


Fig 8-4 Lock / Unlock View

8.2.3. Interaction Modes

Roaming mode: This is the default interaction mode. It uses the mouse to browse the point cloud in the 3D scene, for example by panning, zooming, and rotating. Specifically:

Pan: Hold down the right mouse button and drag.

Rotate: Hold down the left mouse button and drag.

Zoom: Scroll the middle mouse button (wheel).

Move to center of scene: Double-click the scene to move that position to the center.

First-person mode: This mode uses the keyboard to browse the point cloud in the 3D scene:

W: Move forward.

S: Move backward.

A: Move left.

D: Move right.

Q: Move downward.

E: Move upward.

Mouse wheel: Adjusts scene movement speed.

8.2.4. Projection Modes

Perspective mode: This is the default projection mode. It follows the human visual effect of near objects appearing larger and distant objects appearing smaller, giving a more realistic sense of space.

Orthographic mode: This is a view without perspective distortion. All axes remain parallel and do not converge with distance. This mode helps with precise distance measurement and size comparison.

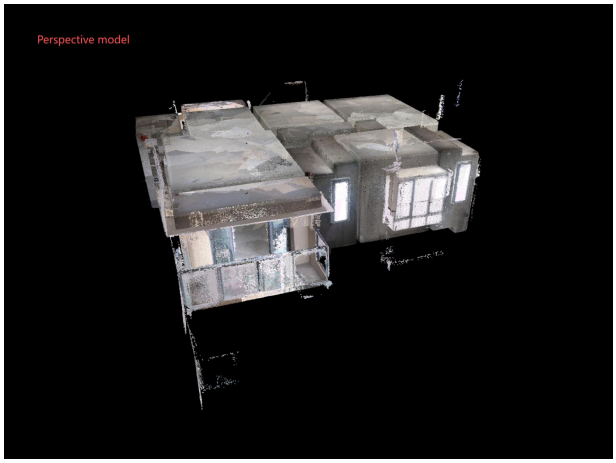


Fig 8-5 Perspective Mode / Orthographic Mode

8.2.5. EDL Effect

EDL (Eye-Dome Lighting) is a visual enhancement technique that simulates lighting effects to improve the depth perception and contour clarity of point clouds, making model details more prominent.

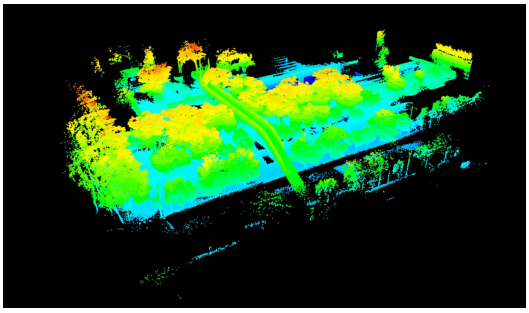


Fig 8-6 EDL Effect

8.2.6. Measurement Tool Group

The Measurement Tool Group includes several sub-functions such as position measurement, two-point measurement, multi-point measurement, area measurement, and angle measurement. Measurement results can be saved in the directory tree of the [Data Management] panel.

The measurement functions are displayed at the top of the model space by default.

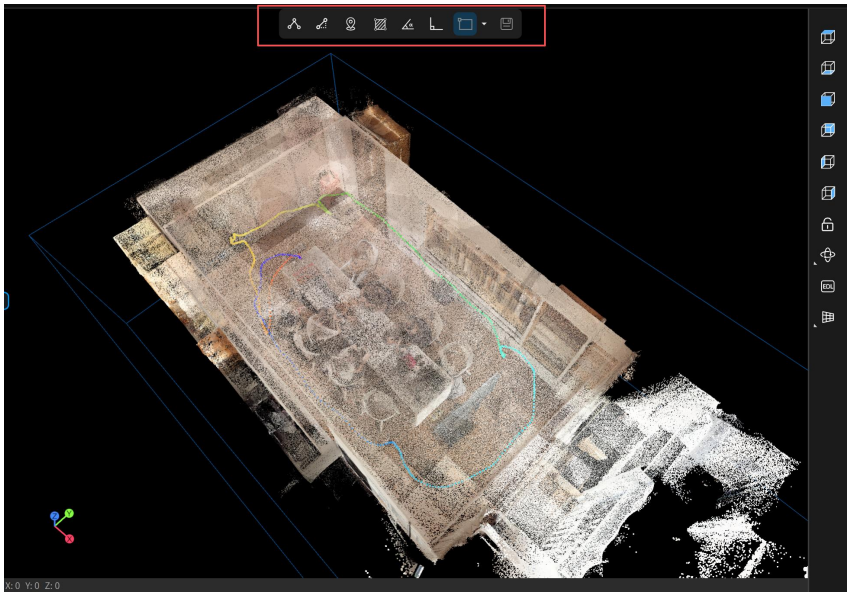


Fig 8-7 "Measurement" Function

8.2.6.1. Multi-Point Measurement

1. Click **Multi-Point Measurement** to activate the function.

2. Left-click in the scene to add vertices one by one. Press Ctrl+Z to undo the last point, and right-click to finish the measurement. A save confirmation dialog then appears.

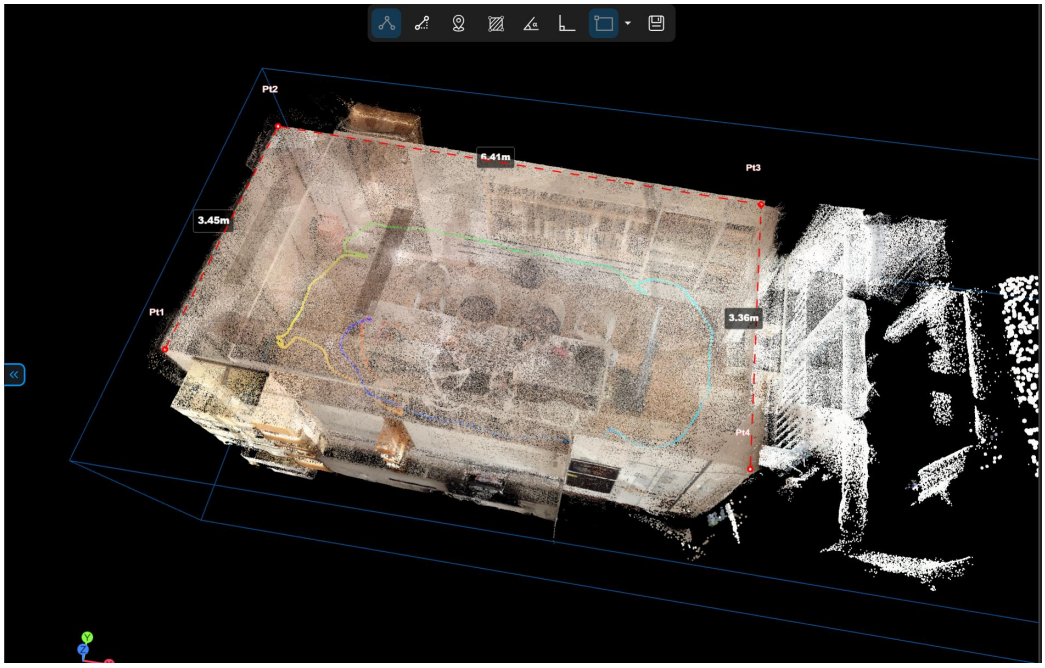


Fig 8-8 Multi-Point Measurement

3. Click **Save** to save the measurement record in the directory tree of the [**Data Management**] panel.

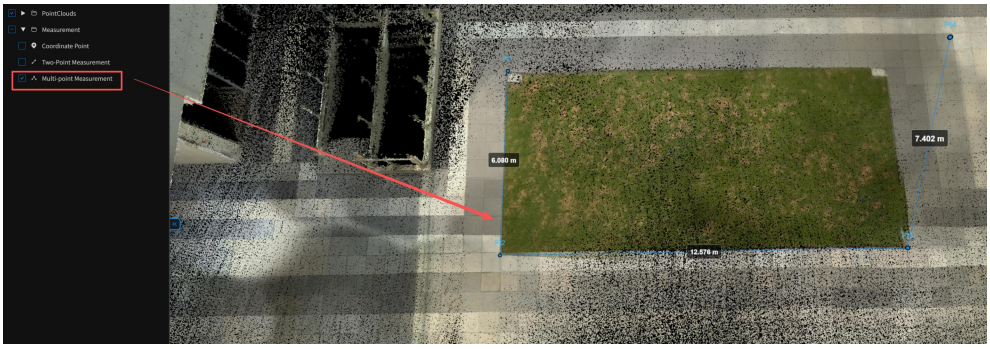


Fig 8-9 Generated Length Measurement Record

4. Measurement layers in the directory tree support operations such as selection, locating, and renaming. See **Measurement Layer Operations** for details.

8.2.6.2. Triangle Measurement

1. Click Triangle Measurement to activate the function.

2. **Left-click** in the scene to add two vertices and draw a line segment. The measurement result is calculated directly in the scene.

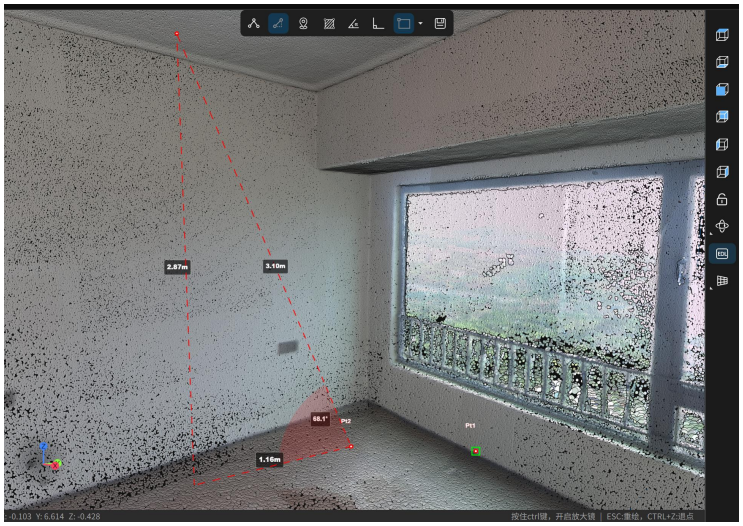


Fig 8-10 Triangle Measurement

3. Click **Save** to save the measurement record in the directory tree of the [**Data Management**] panel.

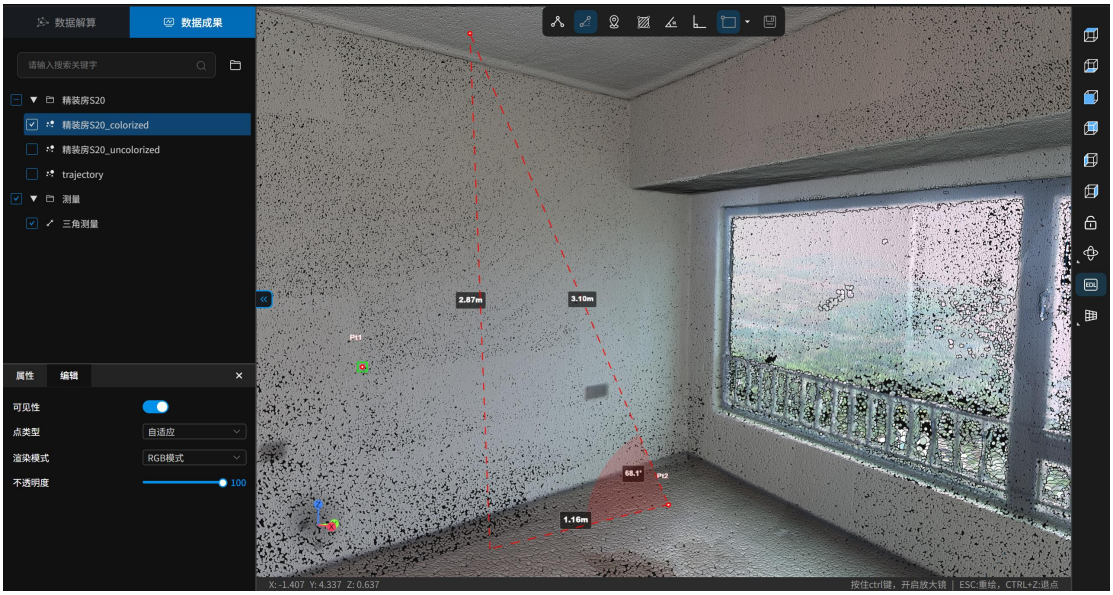


Fig 8-11 Generated Two-Point Measurement Record

4. Measurement layers in the directory tree support operations such as selection, locating, and renaming. See **Measurement Layer Operations** for details.

8.2.6.3. Position Measurement

1. Click Position Measurement to activate the function.

2. Left-click in the scene to add points one by one (Pt1, Pt2, ...) with X, Y and Z coordinates shown for each; press Ctrl+Z to undo the last point, or click Remove on a coordinate card to delete that point.

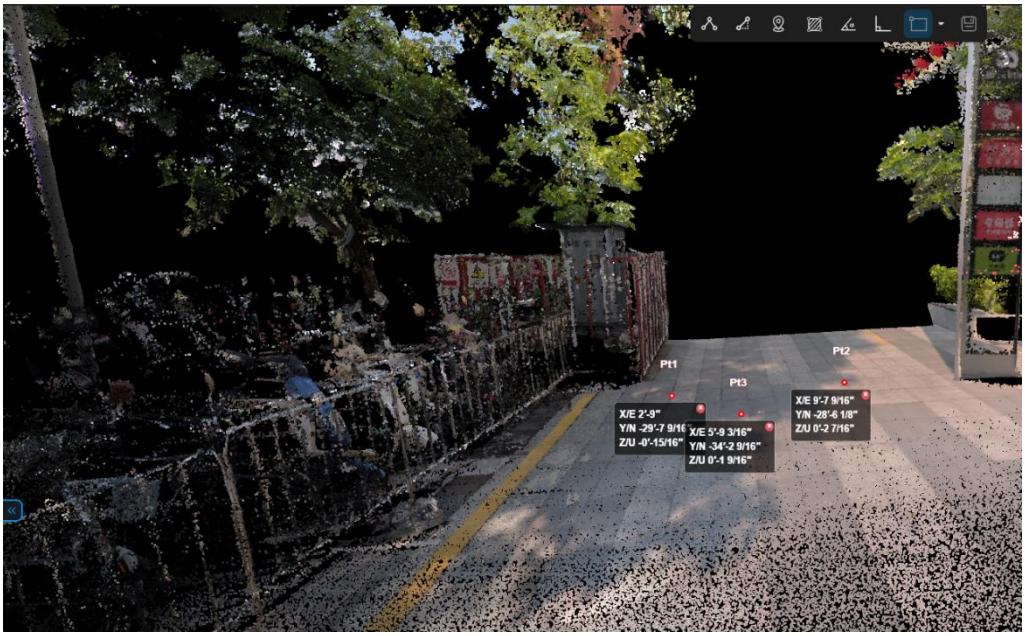


Fig 8-12 Position Measurement

3. Click Save to save the measurement records in the directory tree of the [Data Management] panel; multiple points can be saved as a group.



Fig 8-13 Generated Coordinate Point Measurement Layer

4. Right-click the saved group in the directory tree and choose Export to export all its points to one TXT file, including each point name and X, Y and Z coordinates in the current display unit.

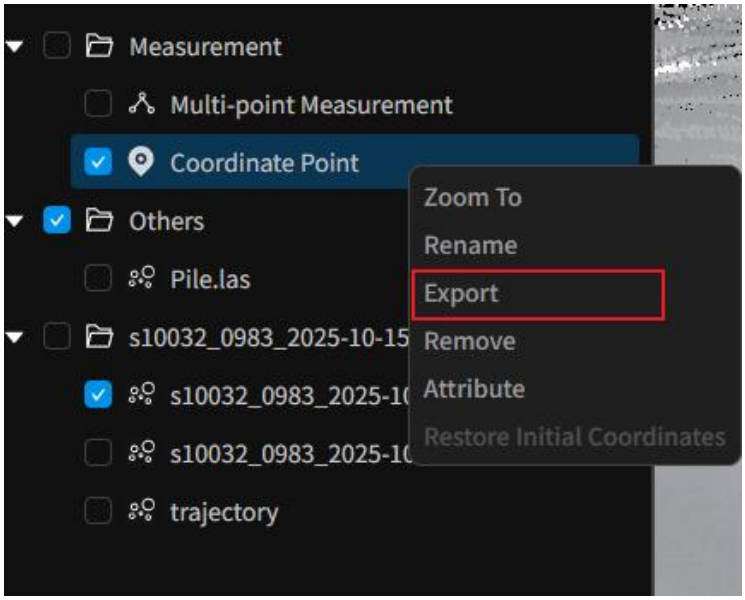


Fig 8-14 Coordinate Point Export

5. Measurement layers in the directory tree support operations such as selection, locating, and renaming. See Measurement Layer Operations for details.

8.2.6.4. Area Measurement

1. 1. Click Area Measurement to activate the function.

2. 2. Left-click in the scene to draw a polygon. Press Ctrl+Z to undo the last point, and right-click to finish drawing. After drawing is complete, a save confirmation dialog appears.



Fig 8-15 Area Measurement

3. Click **Save** to save the measurement record in the directory tree of the [**Data Management**] panel.

4. Measurement layers in the directory tree support operations such as selection, locating, and renaming. See **Measurement Layer Operations** for details.

8.2.6.5. Angle Measurement

1. 1. Click Angle Measurement to activate the function.

2. 2. Left-click in the scene to draw a triangle (Ctrl+Z is supported for undoing a point).



Fig 8-16 Angle Measurement

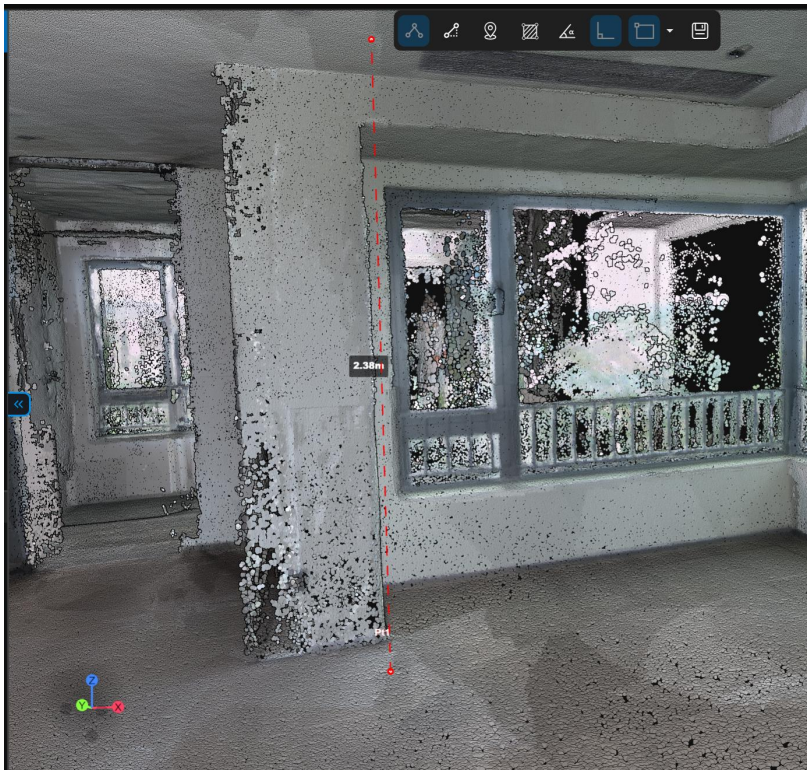
3. Click **Save** to save the measurement record in the directory tree of the [**Data Management**] panel.

4. Measurement layers in the directory tree support operations such as selection, locating, and renaming. See **Measurement Layer Operations** for details.

8.2.6.6. Orthogonal

1. Click Orthogonal to activate the orthogonal function.

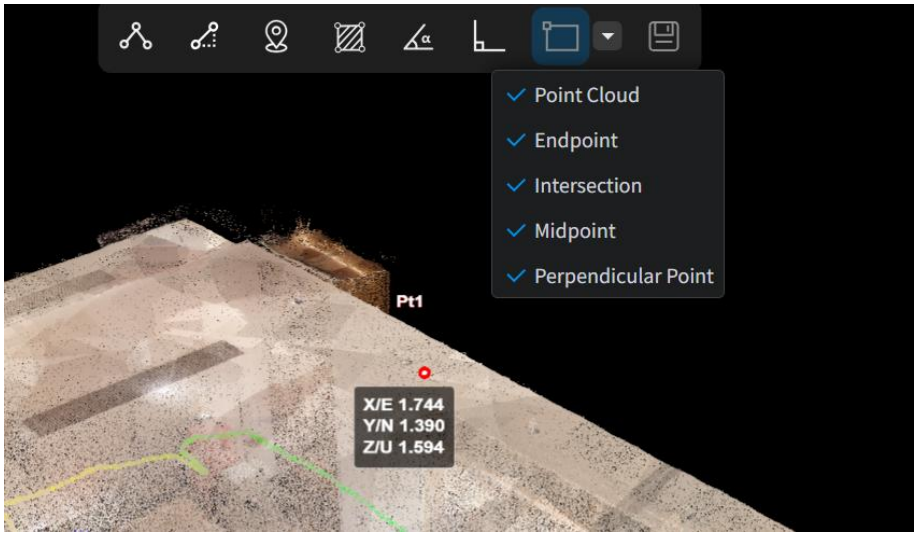
2. During measurement, the X/Y/Z axis directions can be locked.



8.2.6.7. Snap

1. Click Snap to activate the snapping function.

2. Select a snap type to snap to point clouds, endpoints, intersections, midpoints, or perpendicular points.



3. When a point is snapped, a green snap box is displayed.



8.2.6.8. Magnifier

1. During measurement, hold down Ctrl to enable the magnifier. The enlarged view helps place measurement points more precisely.



8.3. Coordinate Axis

The coordinate axis matches the orientation of the 3D scene and helps the user understand the current direction and rotation state of the scene.

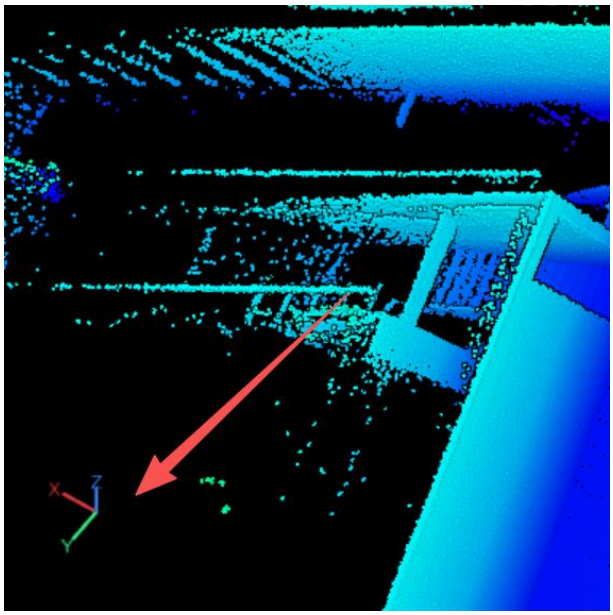


Fig 8-17 Coordinate Axis

8.4. Status Bar

The status bar displays position information and a general prompt area. Specifically:

Position information: Located in the lower-left corner of the software. When you click in the 3D scene, it displays the coordinates of the picked point cloud point.

General prompt area: Located in the lower-right corner of the software. For operations that need to show progress, such as opening an **LAS** file, it displays text prompts and a progress bar, and also supports canceling the operation.



Fig 8-18 Status Bar

Chapter 9. Function Area

The **Function Area** is located below the title bar and serves as the main entry point for software functions.

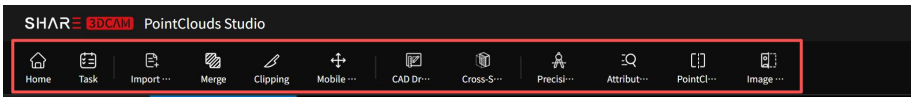


Fig 9-1 Function Area

9.1. Return to the Main Interface

Click this button to return to the software main interface, that is, the **Project Management** interface.

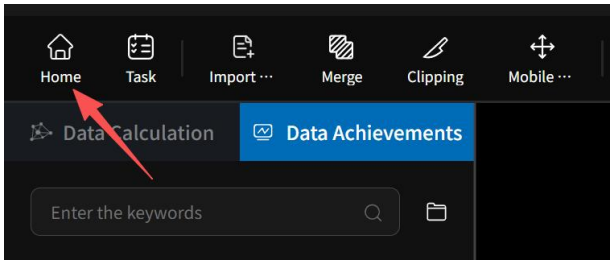


Fig 9-2 Return to Main Interface

9.2. Task Management

Task Management is used to manage ongoing and historical reconstruction tasks. You can view the progress of the current task, cancel a reconstruction task, or adjust the execution order of mapping tasks. For historical reconstruction tasks, you can view, remove, or retry them.

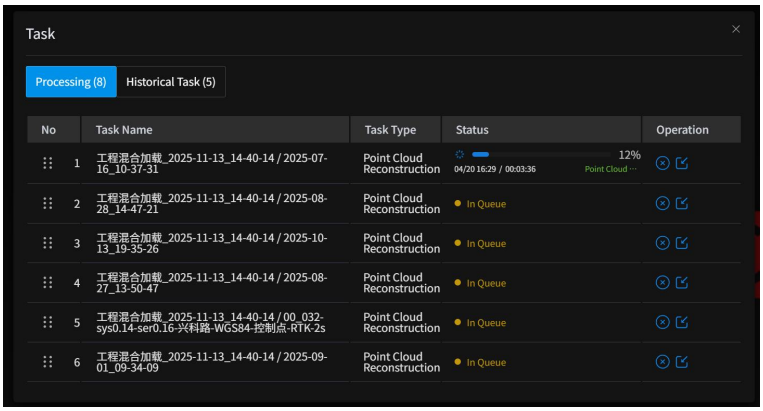


Fig 9-3 Task Management

9.2.1. Processing Tasks

Task names are shown as **Project Name / Raw Data Name**. Ongoing tasks are executed in sequence.

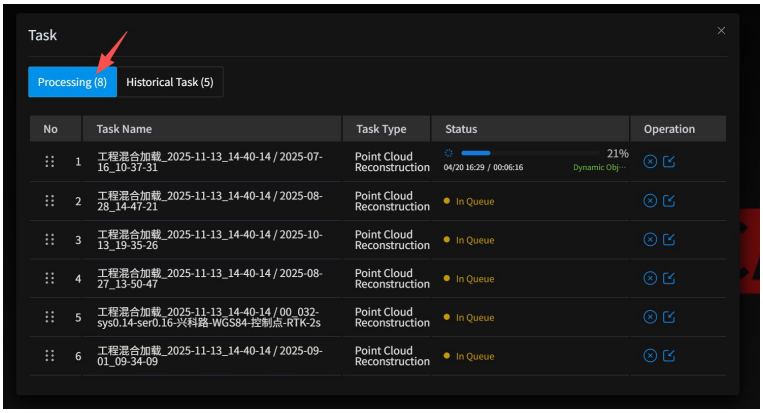


Fig 9-4 Processing Task List

9.2.1.1. Current Reconstruction Task

A **Current Reconstruction Task** is the task that is actively being reconstructed. You can view its start time, elapsed reconstruction time, and reconstruction progress. There is always only one **Current Reconstruction Task**.

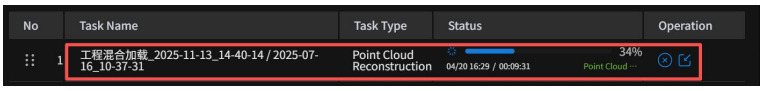


Fig 9-5 Current Reconstruction Task

After the task is completed, it is removed from the **Ongoing list** and a corresponding record is created in the **History list**. See **History Tasks** for details.

You can click **Cancel** in the action column to stop the task. After cancellation, the record is removed from the **Ongoing List** and a corresponding record is created in the **History list**. See **History Tasks** for details.



Fig 9-6 Cancel Task

You can also click **Open Project** in the action column to open the corresponding project in the **Project Browsing interface**.

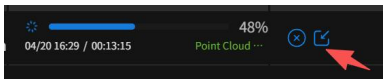


Fig 9-7 Open Project

9.2.1.2. Queued Tasks

Tasks in the **Queued** state are executed in order after the current reconstruction task finishes or is canceled, becoming the new **Current Reconstruction task**.

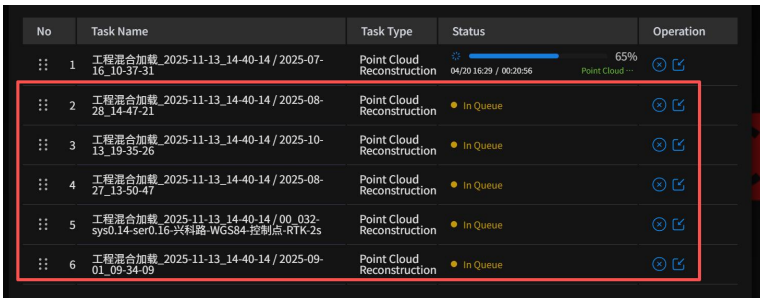


Fig 9-8 Queued Task

You can click **Cancel** in the action column to stop the task. After cancellation, the record is removed from the **Ongoing list** and a corresponding record is created in the **History list**. See **History Tasks** for details.

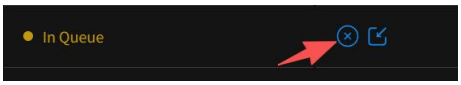


Fig 9-9 Cancel Task

You can also click **Open Project** in the action column to open the corresponding project in the **Project Browsing** interface.

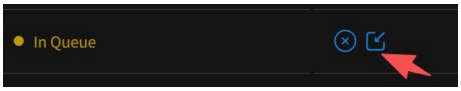


Fig 9-10 Open Project

9.2.1.3. Adjusting Task Order

You can drag the handle at the front of a task record to change the task order. Except for the **Current Reconstruction task**, other tasks are executed in the adjusted order.

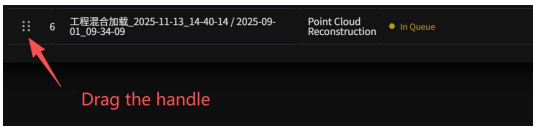


Fig 9-11 Task Order Adjustment

9.2.2. History Tasks

Tasks that finished successfully, failed, or were canceled can be viewed in the **History Tasks** list. Supported operations include retrying, removing, and uploading logs.

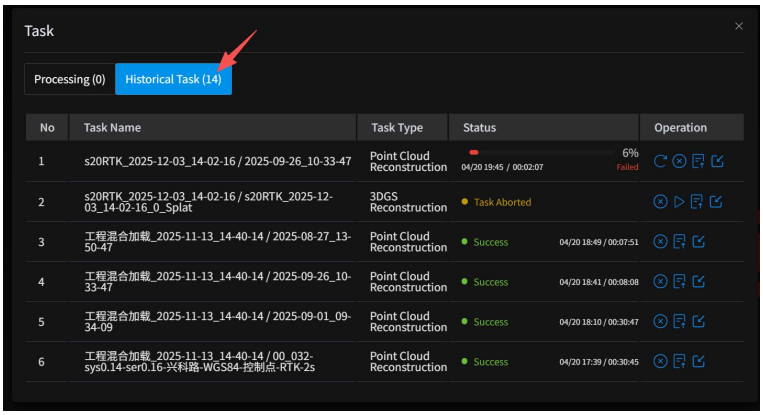


Fig 9-12 History Task List

9.2.2.1. Successful Mapping Task

For a successfully completed mapping task, you can view its start time and total reconstruction duration. Click **Remove** in the action column to delete the record from the list.

Click **Upload Log** in the action column to upload the reconstruction log file. See **Log Upload** for details.

You can also click **Open Project** in the action column to open the corresponding project in the **Project Browsing** interface.

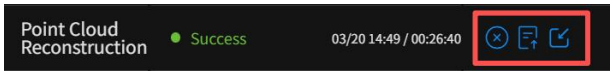


Fig 9-13 Successful Mapping Task

9.2.2.2. Failed Reconstruction Task

For a failed reconstruction task, you can view the task start time, the elapsed time before failure, and the corresponding progress. Click **Retry** in the action column to remove the record from **History Tasks** and add a new record to the end of the **Ongoing list**.

Click **Remove** in the action column to delete the record from the list.

Click **Upload Log** in the action column to upload the reconstruction log file.See **Log Upload** for details.

You can also click **Open Project** in the action column to open the corresponding project in the **Project Browsing** interface.

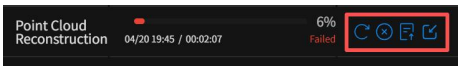


Fig 9-14 Failed Reconstruction Task

9.2.2.3. Canceled Task

For a canceled task, you can click **Retry** in the action column to remove the record from **History Tasks** and add a new record to the end of the **Ongoing list**.

Click **Remove** in the action column to delete the record from the list.

Click **Upload Log** in the action column to upload the reconstruction log file.See **Log Upload** for details.

You can also click **Open Project** in the action column to open the corresponding project in the **Project Browsing** interface.

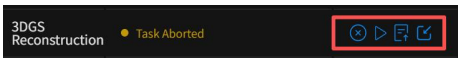


Fig 9-15 Canceled Task

9.2.3. Log Upload

If the point cloud reconstruction result is abnormal, you can send the log of the corresponding project to **SHARE** for troubleshooting.

Completed mapping tasks appear in the **History Tasks** list. Click **Upload Log** in the action column of the task to upload the log for that reconstruction task.

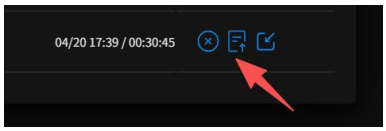


Fig 9-16 Upload Log Entry

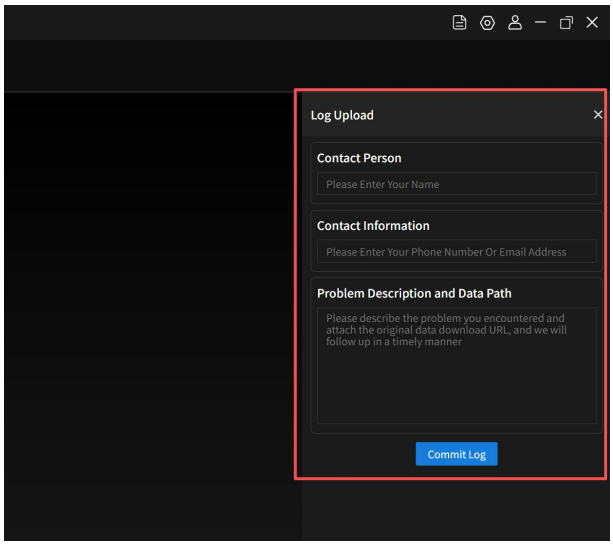


Fig 9-17 Log Upload Dialog

In the **Upload Log** dialog box, enter the contact person, contact information, and issue description, then click **Submit Log** to send the reconstruction log to **SHARE**.

Note: Before uploading a log, you must log in to your SHARE account. See User Login and Registration for details.

9.3. Import Data

You can add external point cloud data in .las, .laz, .ply, and .pcd formats to the 3D scene. PLY-format 3D Gaussian data is also supported. Imported data is placed under the root directory of the [Project Management] panel.

In the **Project Browsing** interface, click **Import Data** to open the **Import Data** dialog box. Browse to the location of the point cloud data, select the file to add, and click **Open**.

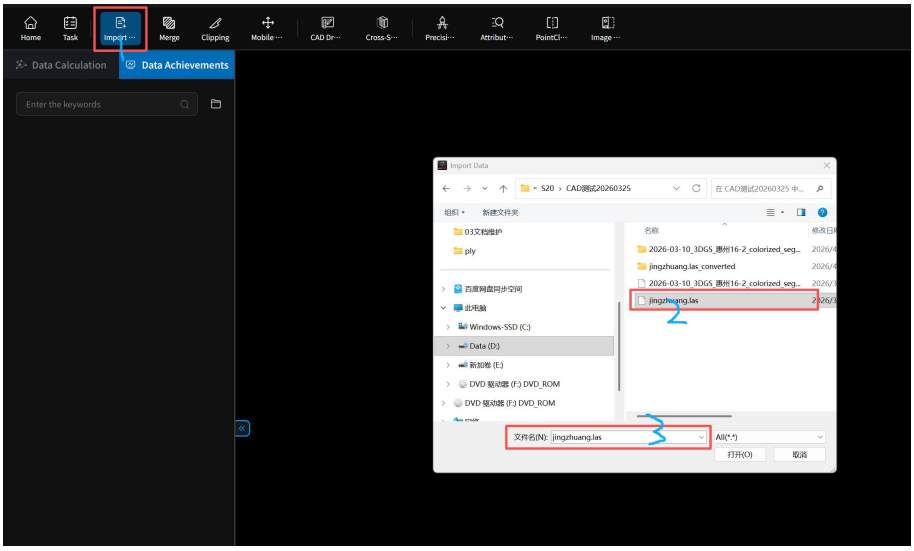


Fig 9-18 Import Data

During the import process, the progress is displayed in the lower-right corner of the software.

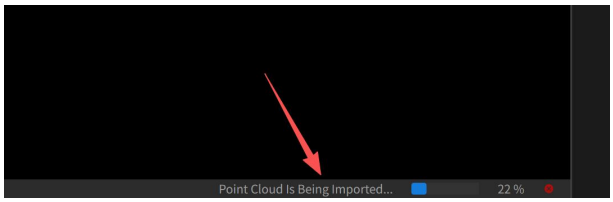


Fig 9-19 Point Cloud Import Progress

After the import is complete, the corresponding data is added to the root directory of the [**Data Management**] panel.

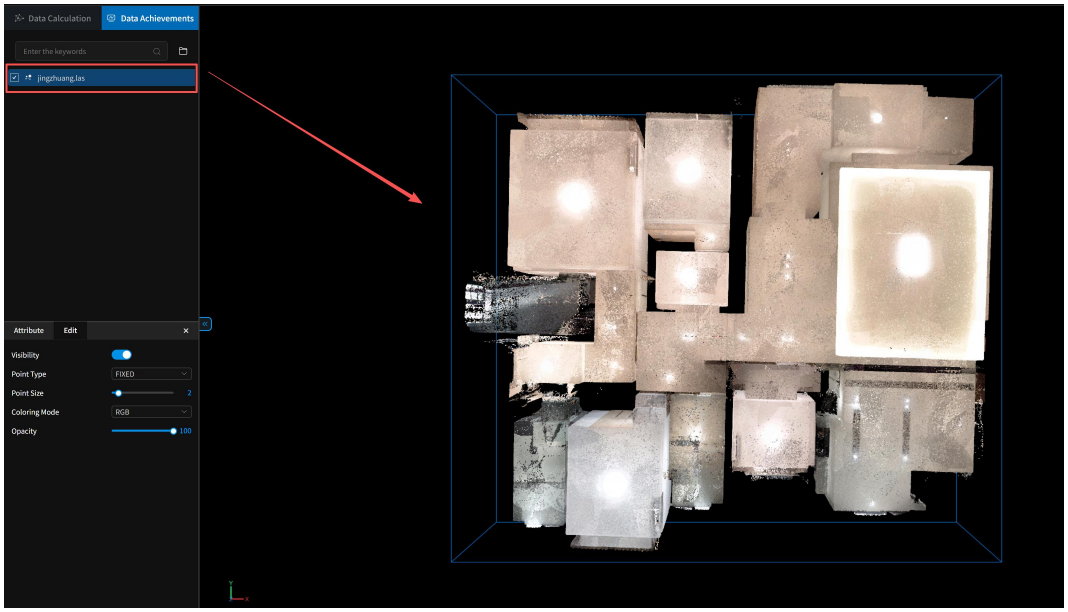


Fig 9-20 Imported Point Cloud Data

Note: You can drag a layer to change its order in the directory tree. See Sorting for details. You can also add the layer directly into a layer group. See Layer Group Operations -> Import Data.

9.4. Point Cloud Merge

Point Cloud Merge combines multiple point clouds into a single point cloud.

1. 1. Add the point clouds to be processed to the 3D scene. In the Function Area, click Merge to open the Point Cloud Merge dialog box.

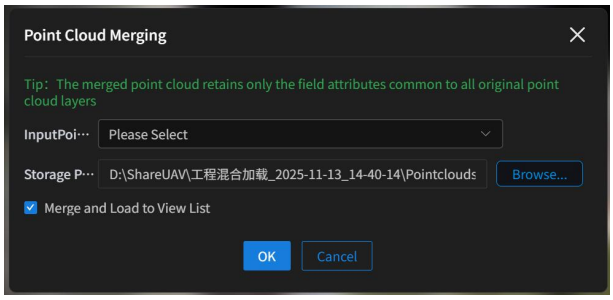


Fig 9-21 Point Cloud Merge

2. Set the point cloud merge parameters. Click the **Input Point Cloud** drop-down list to display all point clouds in the directory tree, then select the point clouds to be merged. The **Storage Path** defaults to the current project path. Click **Browse...** to customize the storage path and file name of the merged point cloud. Load to View List After **Merge** is selected by default and may be cleared.

Click **OK** to perform point cloud merging. The software displays execution progress in the lower-right corner. If Load to View List After Merge is selected, the merged result point cloud is added to the 3D view after the task is completed.

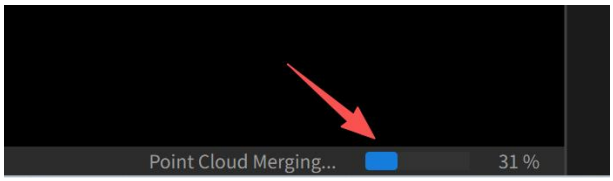


Fig 9-22 Point Cloud Merge Progress

9.5. Point Cloud Clipping

Point cloud clipping extracts part of a point cloud and saves it separately. Two clipping methods are supported:

Method 1: Use the **Polygon / Rectangle** tool to draw a region, and save the point cloud inside or outside the drawn region.

Method 2: Use the **3D Clipping** tool to control the clipping box range and orientation by dragging interactors manually or adjusting parameters, then save the point cloud inside the box.

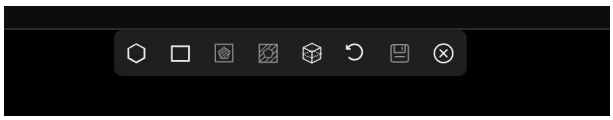


Fig 9-23 Point Cloud Clipping Tool Group

9.5.1. Polygon / Rectangle Point Cloud Clipping

1. Add and select the data to be processed (point cloud, 3DGS or imported 3D model) in the [**Data Management**] panel. Adjust the point cloud rendering mode to make the operation easier. Other data can be hidden or removed to avoid interference.

2. In the main function area, click **Clipping** to activate the function. The **Point Cloud Clipping** tool group then appears above the 3D scene.

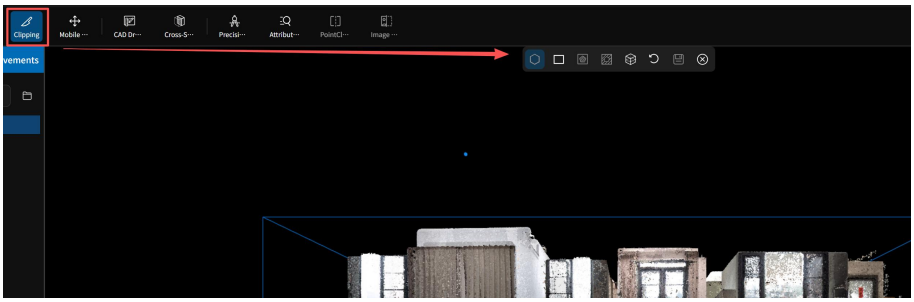


Fig 9-24 Activating Point Cloud Clipping

3. By default, **Polygon Selection** is active in the clipping tool group. You may switch to **Rectangle Selection** as needed.

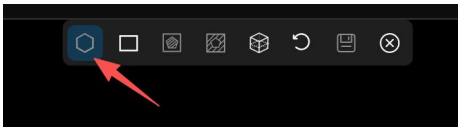


Fig 9-25 Activating Polygon Selection

4. In the 3D scene, left-click to add vertices one by one to draw a polygon (press Ctrl+Z to undo the last point), and right-click to finish drawing.

5. After drawing is complete, inside clipping is performed by default. You can switch to outside clipping as needed and preview the result in the scene.

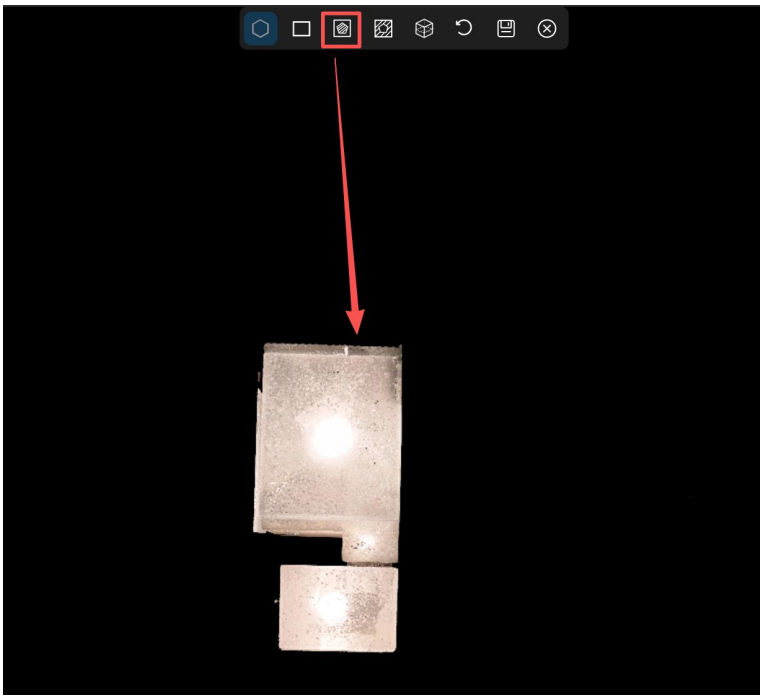


Fig 9-26 Inside Clipping

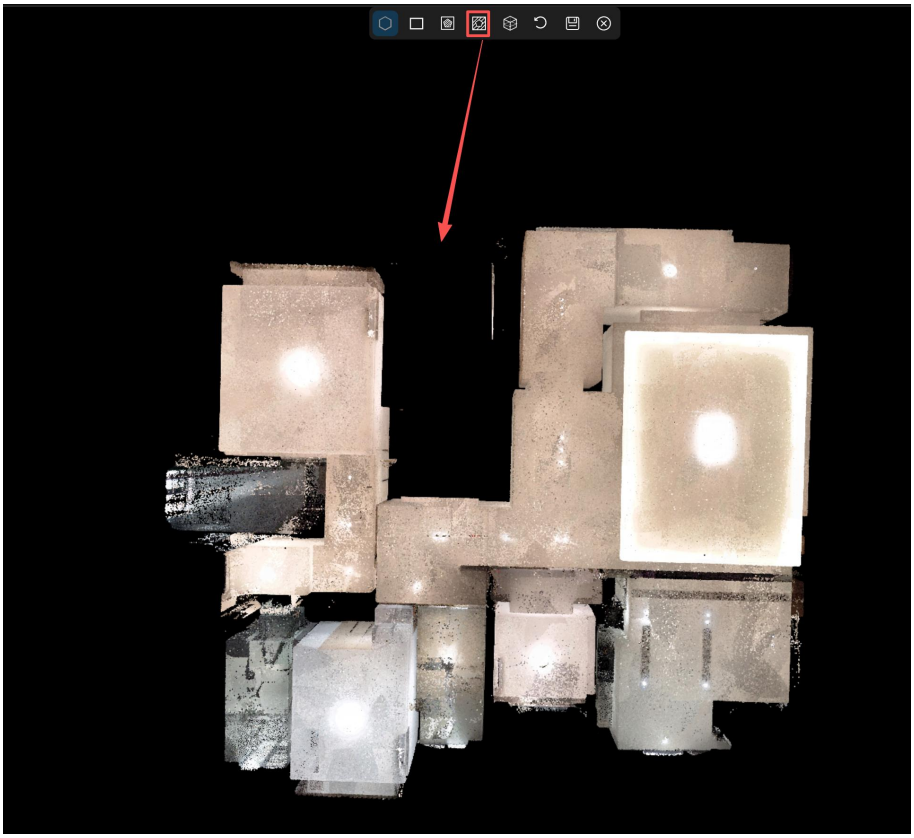


Fig 9-27 Outside Clipping

6. Click Save to open the Save Result dialog box. Click OK to set the result-file save path. After a path is selected, point cloud clipping starts and the clipping progress is displayed in the lower-right corner.

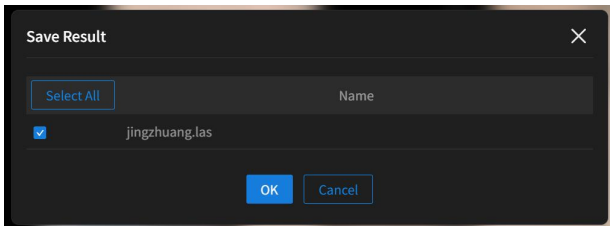


Fig 9-28 Save Result Dialog

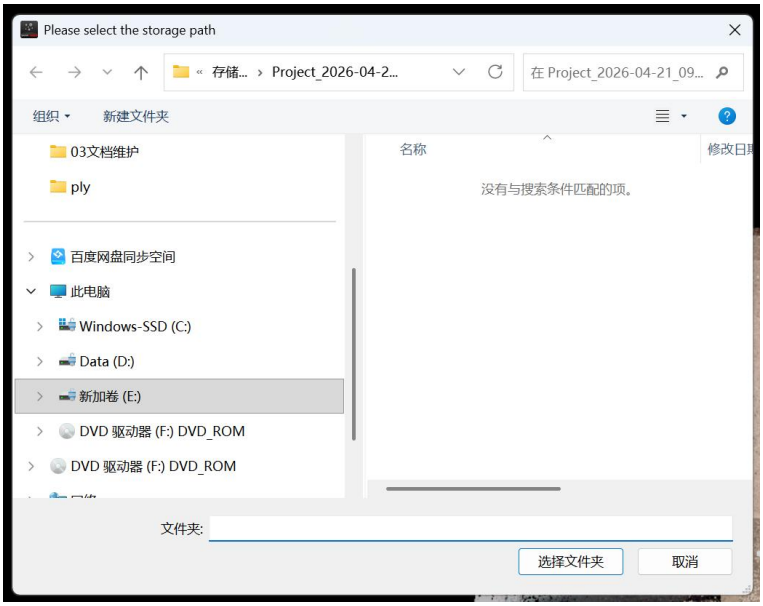


Fig 9-29 Select Storage Path Dialog



Fig 9-30 Point Cloud Clipping Progress

7. When clipping is complete, the software exits Point Cloud Clipping automatically and adds the clipped file to the scene.

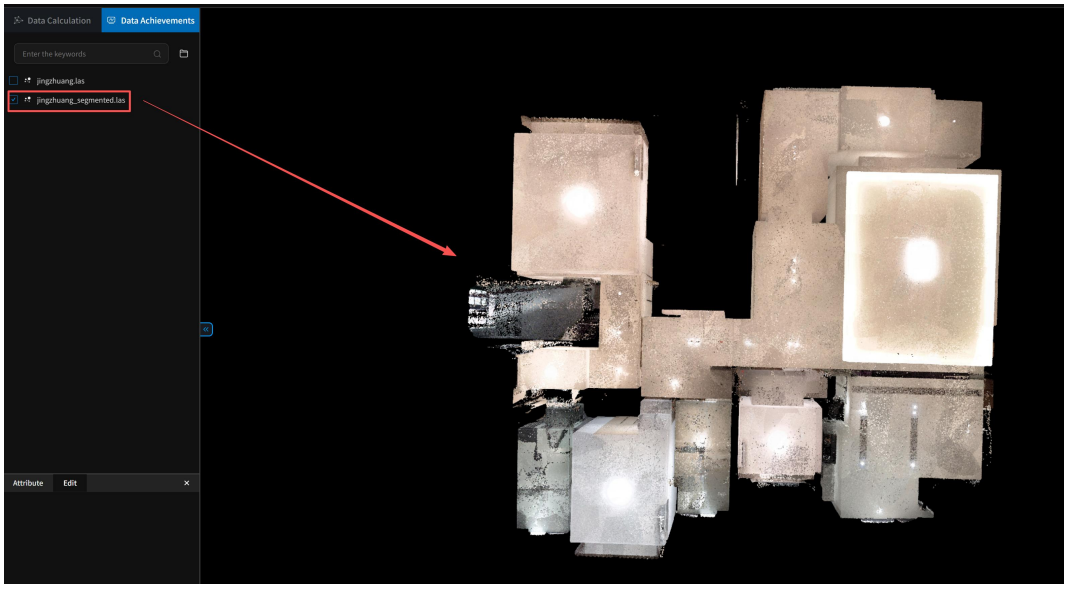


Fig 9-31 Point Cloud Clipping Result

9.5.2. 3D Clipping

1. In the [**Data Management**] panel, add and select the data to be processed (point cloud, 3DGS or imported 3D model). Adjust the rendering mode to make the operation easier. Other data can be hidden or removed to avoid interference.

2. In the main function area, click **Clipping** to activate the function. The Point Cloud Clipping tool group appears above the 3D scene.

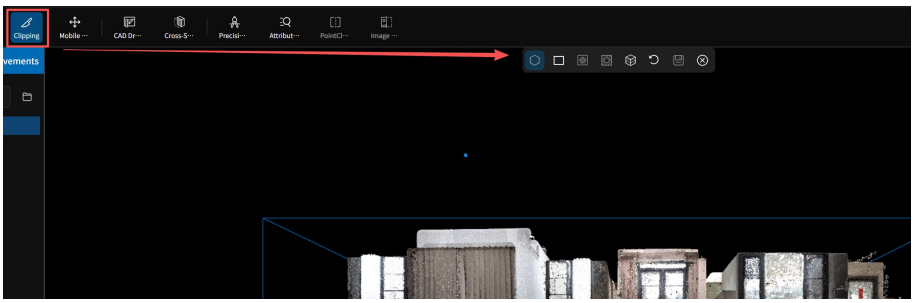


Fig 9-32 Activating Point Cloud Clipping

3. Click the **3D Clipping** button to enable 3D clipping. After the function is enabled, a bounding box and its manipulators appear.

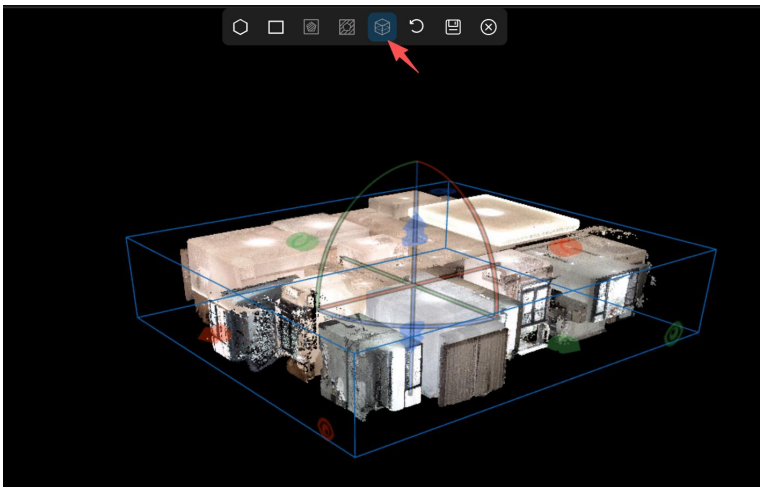


Fig 9-33 Activating 3D Clipping

4. Move the pointer onto a manipulator, then hold down the left mouse button and drag to adjust the size and orientation of the bounding box.

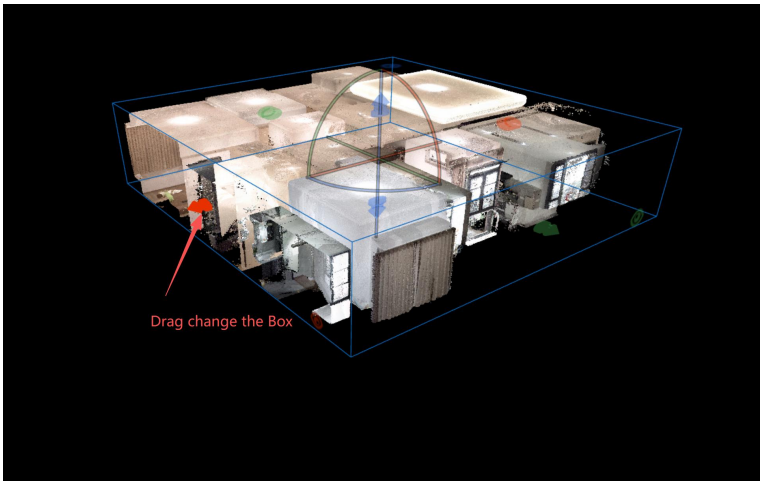


Fig 9-34 Adjusting the Bounding Box

5. Click Save to open the storage-path selection dialog box. Select the path to execute the 3D point cloud clipping operation.

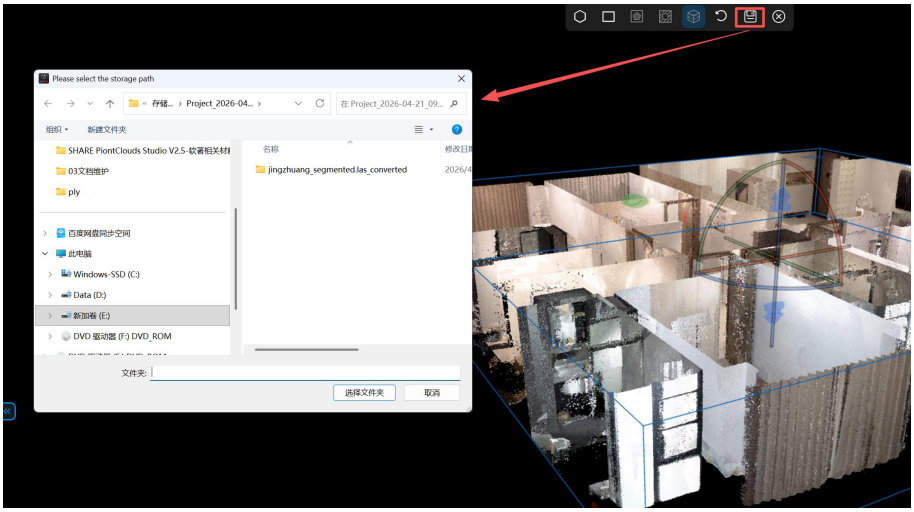


Fig 9-35 Saving the Clipping Result

6. The clipping progress is displayed in the lower-left corner of the software. After 3D point cloud clipping is completed, the software exits the **Point Cloud Clipping** function and adds the clipped point cloud to the scene.

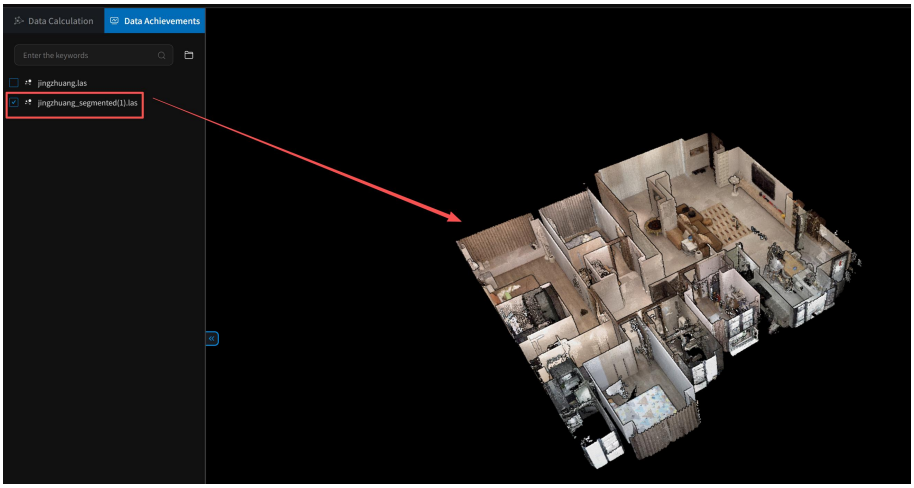


Fig 9-36 Point Cloud After 3D Clipping

9.6. Move and rotation (pose adjustment)

The "Move and Rotate" function allows adjustment of the position and pose of a single result such as a point cloud, 3DGS model or trajectory, including move, rotate and leveling operations. After adjusting, clicking Save takes effect immediately and does not generate new files.

In the left Data Management panel, select the result you want to operate from the directory tree. Click the Move and Rotation button in the main function area to open the Move and Rotate function group, where you can move, rotate and level the result.

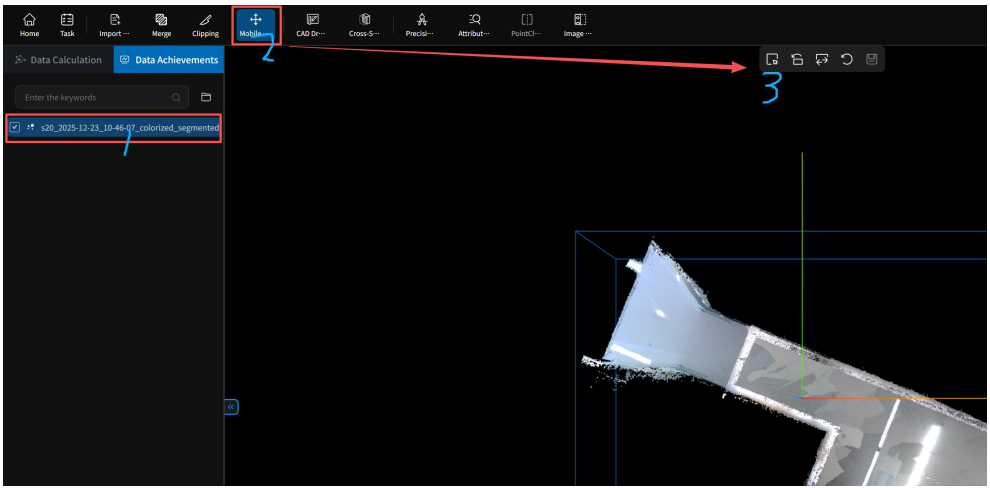


Fig 9-37 Activating Move and Rotate

9.6.1. Point cloud movement operation

1、Click the '**Move**' button in the '**Move and Rotate**' function group to activate the movement tool for the selected result.

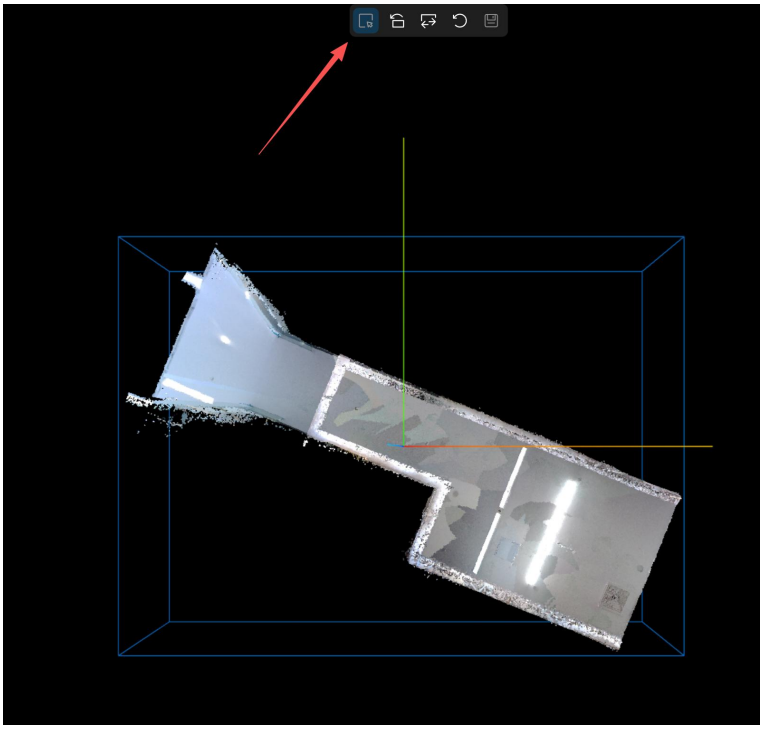


Fig 9-38 Enable the "Mobile" button

2、Follow the mouse prompt to left-click and select the starting point for movement of the selected result in the scene. Drag the mouse to move the selected result accordingly, and then left-click again to complete the movement when it reaches the target position.

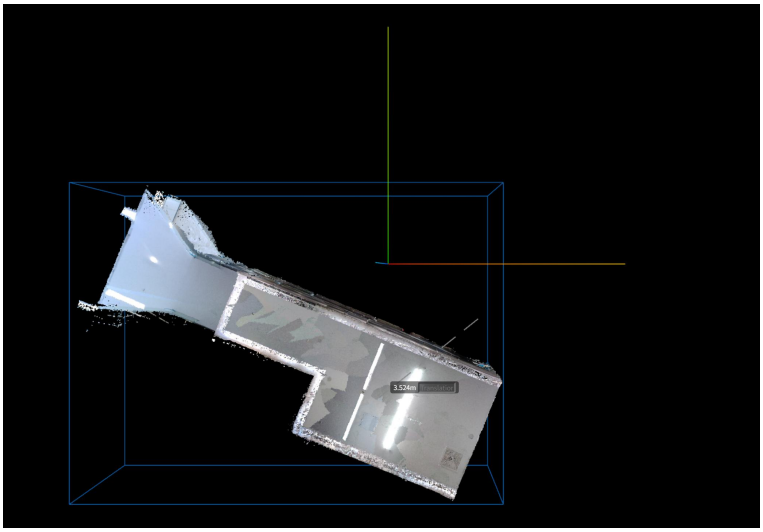


Fig 9-39 Point cloud movement operation

3、You can repeat the above steps to adjust the position of the selected result again.

9.6.2. Point cloud rotation operation

1、1、In the '**Move and Rotate**' function group, click the '**Rotate**' button to activate the rotation tool for the selected result.

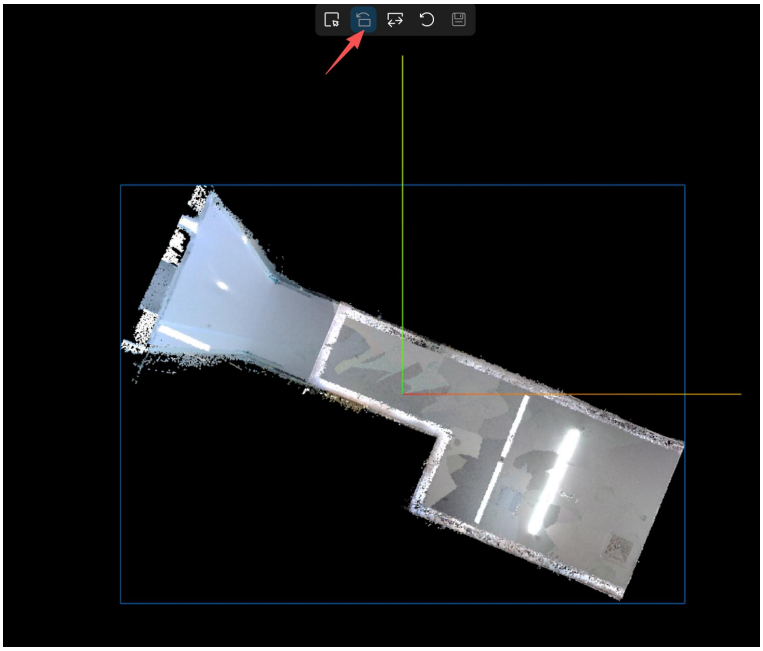


Fig 9-40 Active the "Rotate" button

2、Follow the mouse prompt to left-click in the scene to add two points and draw a line segment. After completion, rotate the selected result using this line segment as the reference.

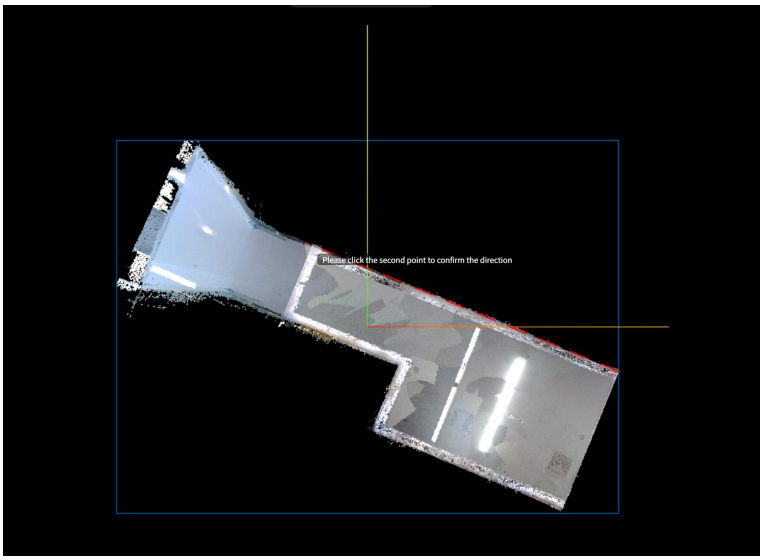


Fig 9-41 Create a rotation reference line

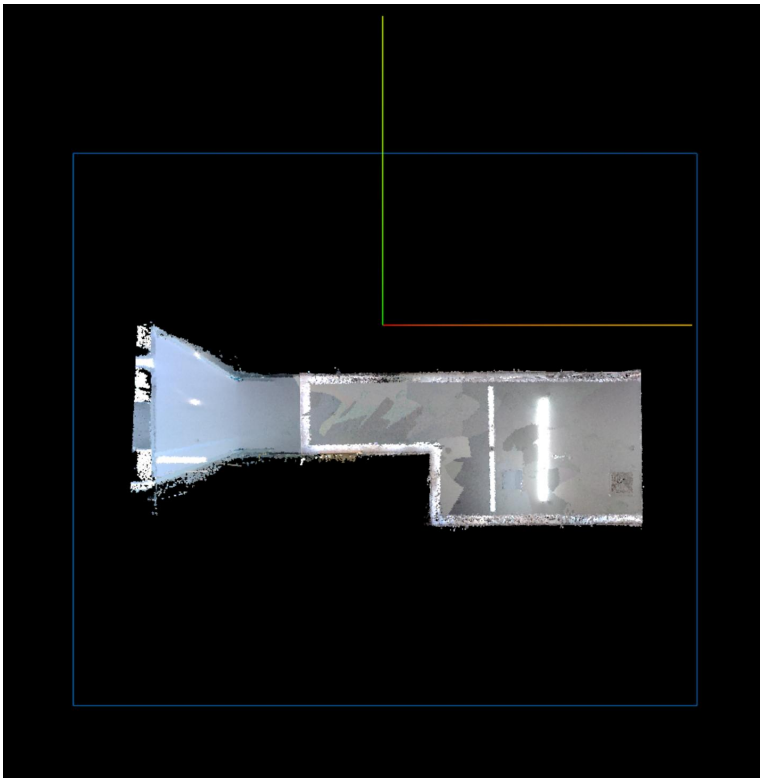


Fig 9-42 The effect after rotation

3、The above actions can be repeated to continue adjusting the pose of the selected result.

9.6.3. Point cloud leveling operation

1、In the '**Move and Rotate**' function group, click the '**Leveling**' button to activate the leveling tool for the selected result.

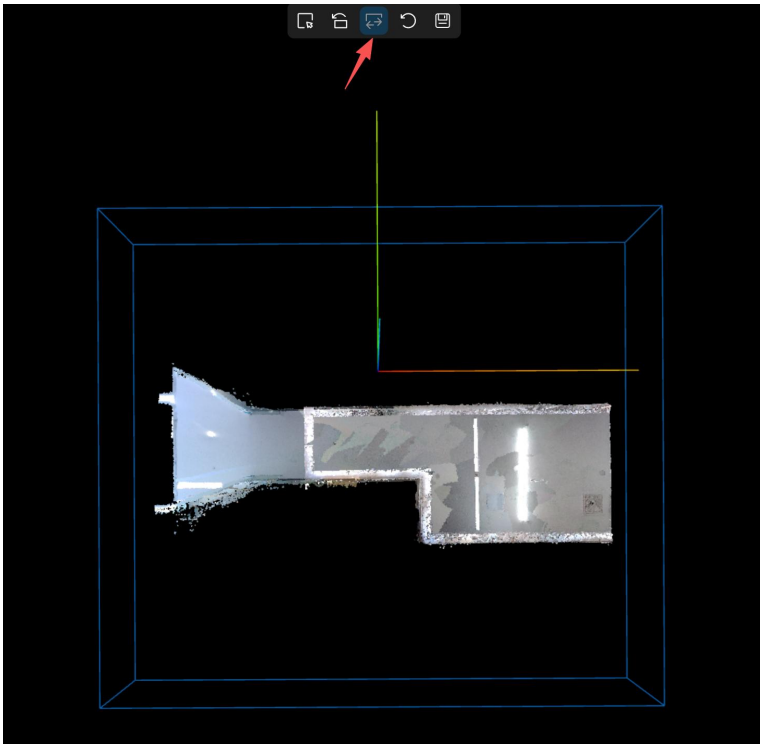


Fig 9-43 Active leveling button

2、Follow the mouse prompt to left-click in the scene to add three points sequentially to draw a plane. After completion, rotate the selected result using the first edge as reference and adjust its orientation based on the plane.

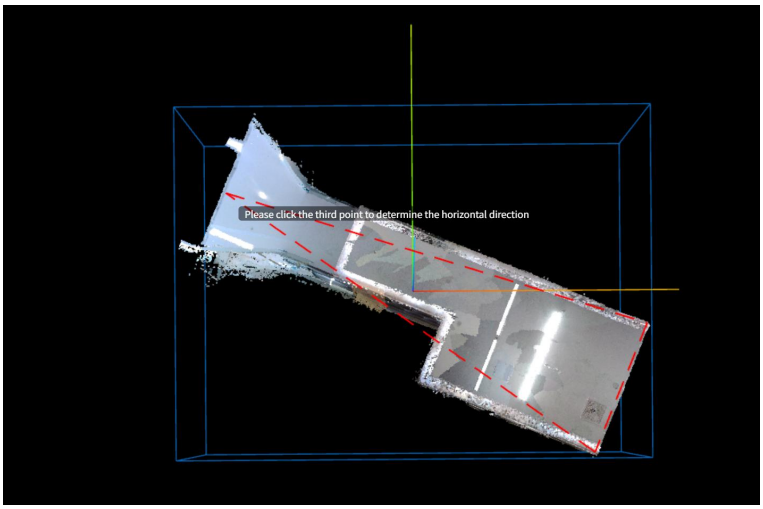


Fig 9-44 Draw a triangular plane

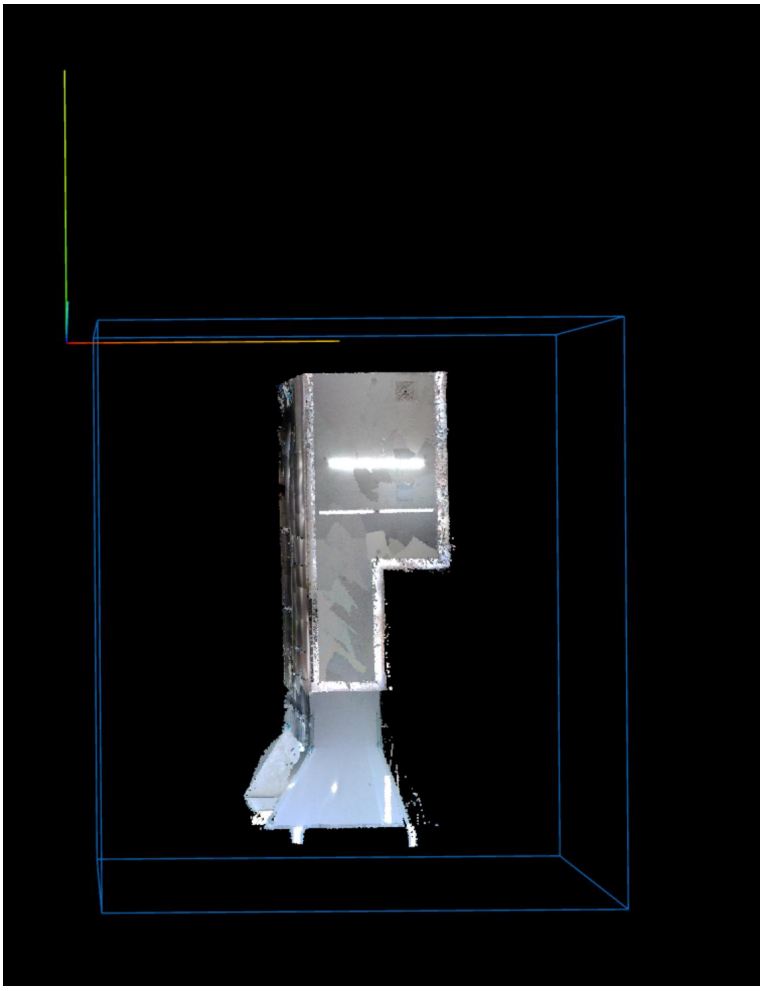


Fig 9-45 Effect after leveling

3、The above actions can be repeated to continue leveling the selected result.

9.6.4. Reset and Save

Reset: After performing movement, rotation, or leveling operations on the selected result, you can click the "**Reset**" button to undo this adjustment; any related files synchronized with this adjustment are reset together. To clear all transformations of a file, leave Move and Rotate mode, then right-click it in the data results directory and choose "Restore Initial Coordinates".

Save: After performing movement, rotation, or leveling on the selected result, click **Save** to save the adjusted result locally. When the moved object is a colored point cloud, uncolored point cloud or 3DGS model generated by the same raw-data solve, saving opens the "Select related results" dialog, where you can check which of the group's colored point cloud, uncolored point cloud, 3DGS model and

trajectory files should follow this transformation (all checked by default; the current file cannot be unchecked); click "Save and sync selected results" or "Save current result only" to finish. To generate a new file of the transformed result, right-click the file in the data results directory and choose "Export".

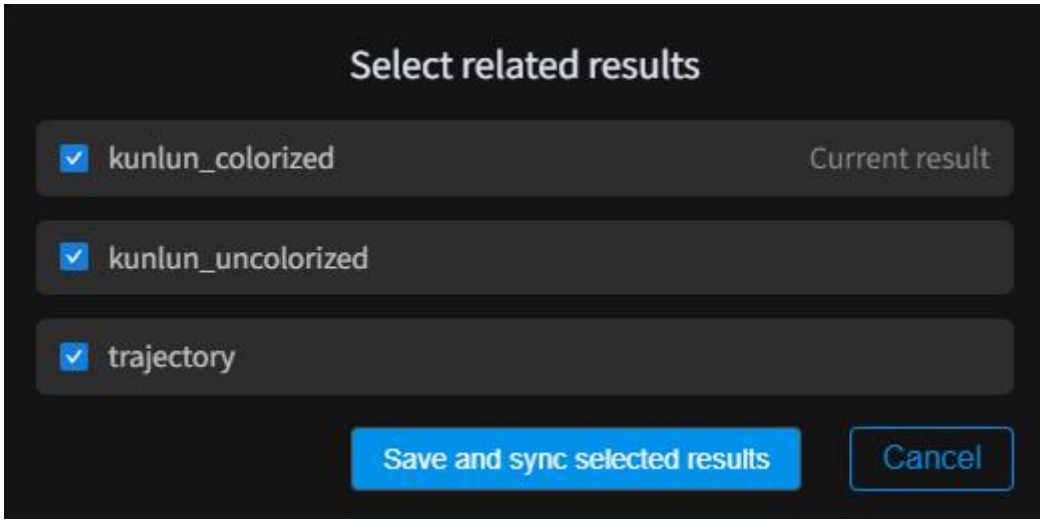


Fig 9-46 Save point cloud

9.7. CAD Drafting

9.7.1. Overview

The **CAD Drafting** module is mainly used to generate floor plans quickly from point clouds and supports exporting CAD files in formats such as DXF. It is intended for customers in interior decoration, design, and building construction. It can be activated in two ways:

Activation method 1: Select a single point cloud file, then click CAD Drawing in the function area. When saving, a vector file is generated and stored under the source point cloud file; the drawing content is stored in that vector file.

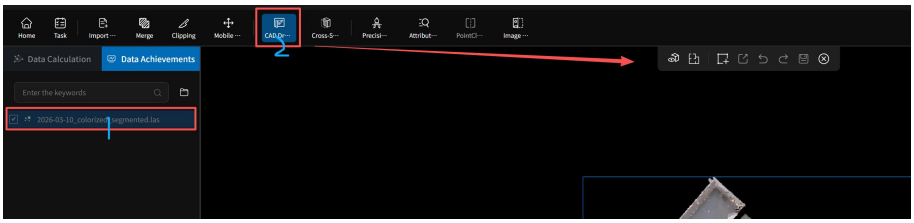


Fig 9-47 CAD Drafting Activation Method 1

Activation method 2: Select an existing vector file, then click **CAD Drawing** in the function area. When **Start Drawing** is enabled, the drawing content is stored in the selected vector file.

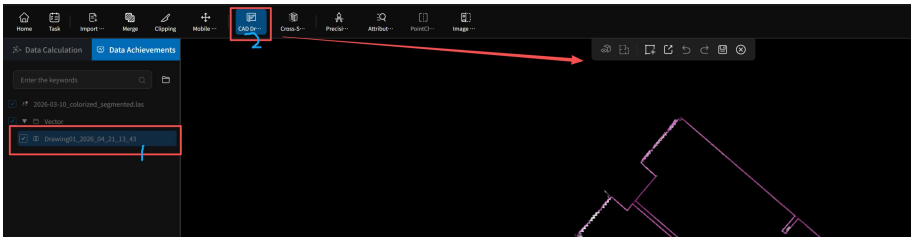


Fig 9-48 CAD Drafting Activation Method 2

After CAD Drafting is activated, a drafting tool group appears at the top of the scene, including Start Drawing, Section Generation, Undo/Redo, Save, Exit, and other functions, as shown below.

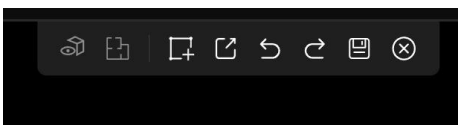


Fig 9-49 Drafting Tool Group

9.7.2. Section Generation

Section Generation cuts a plane from the point cloud to obtain a slice of near-planar point cloud data with a certain thickness. The slice position and thickness can be fine-tuned, and the resulting section can be used to assist drawing. Vector data can also be generated directly from the section point cloud.

Click Section Generation to open the Section Generation dialog box. The Section Generation dialog box supports minimize.

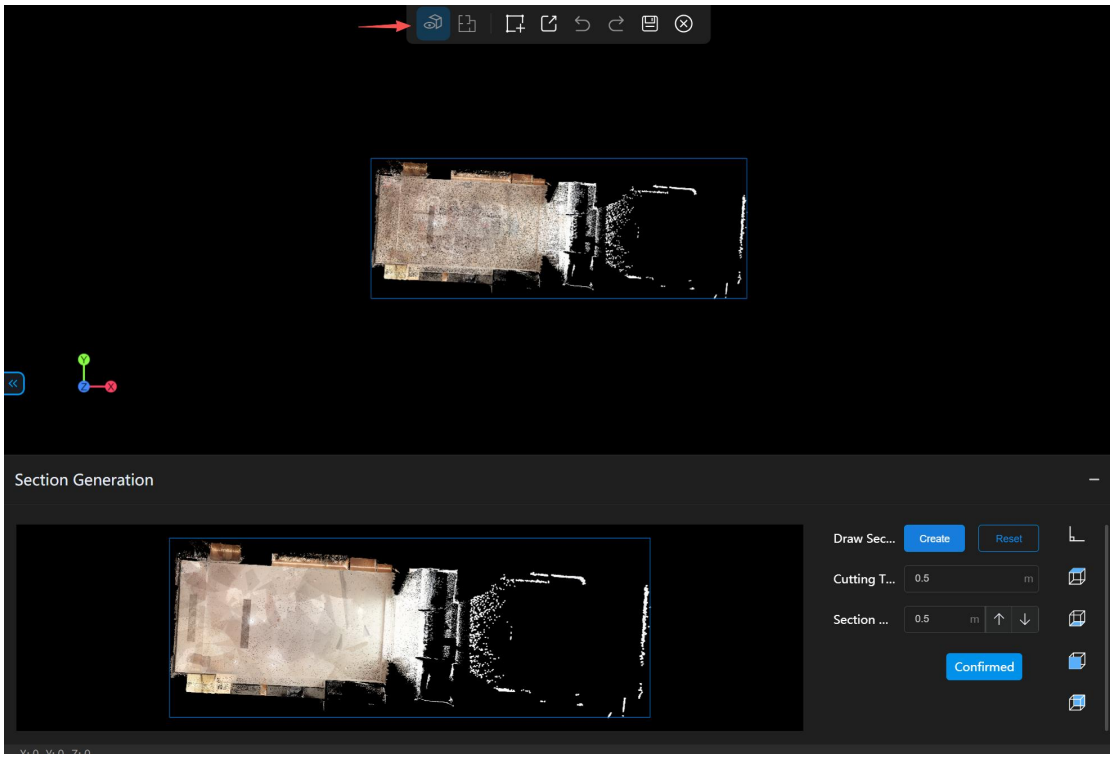
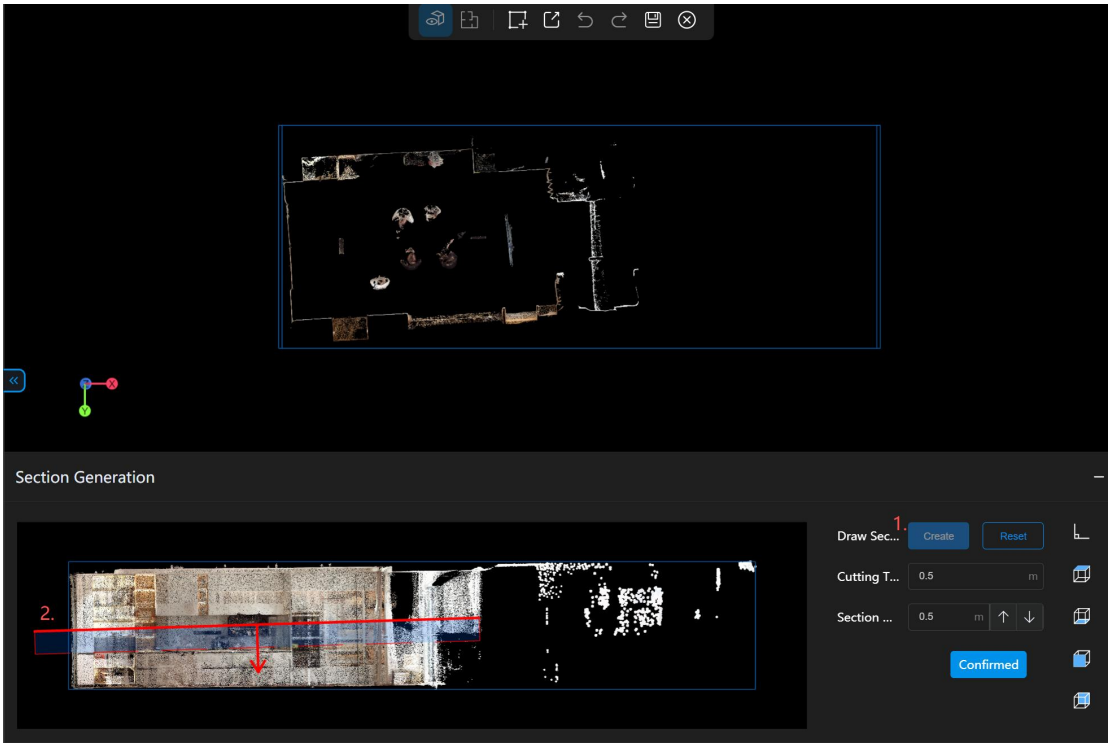


Fig 9-50 Activating the Section Generation Window

You can use the view tools on the side to switch the orientation of the point cloud in the **Section Generation** window. Click **Create**, then left-click in the view to add two points and draw the corresponding section. After the section is drawn, the view shows the corresponding section point cloud.



While drawing, click the Orthogonal button on the right to enable orthogonal mode and keep the section horizontal or vertical.

Fig 9-51 Drawing a Section

The default section thickness is 0.5 m. You can fine-tune the thickness and position to improve the section result.

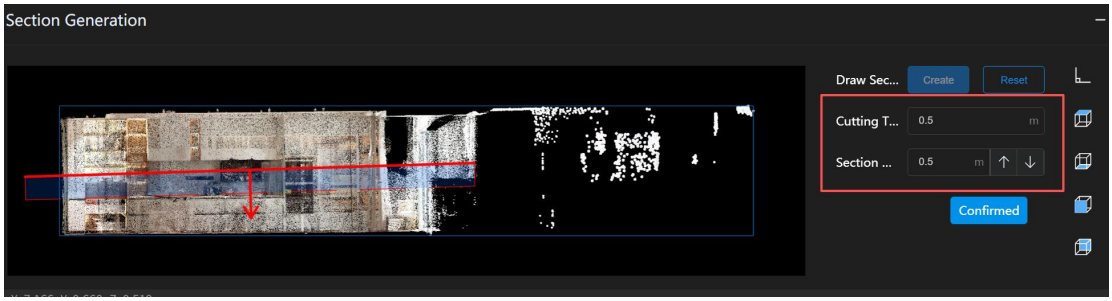


Fig 9-52 Fine-Tuning the Section

Click **Reset** to reset the section. This operation clears already drawn vectors, so use it with caution.

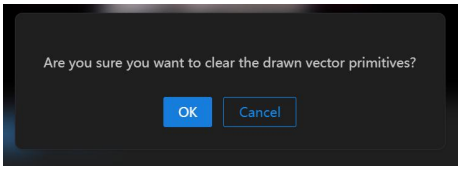


Fig 9-53 Reset Confirmation Dialog

Click **Confirm** to generate the corresponding vectors from the section. You can later enter **Edit and Draw** to edit the generated vectors.

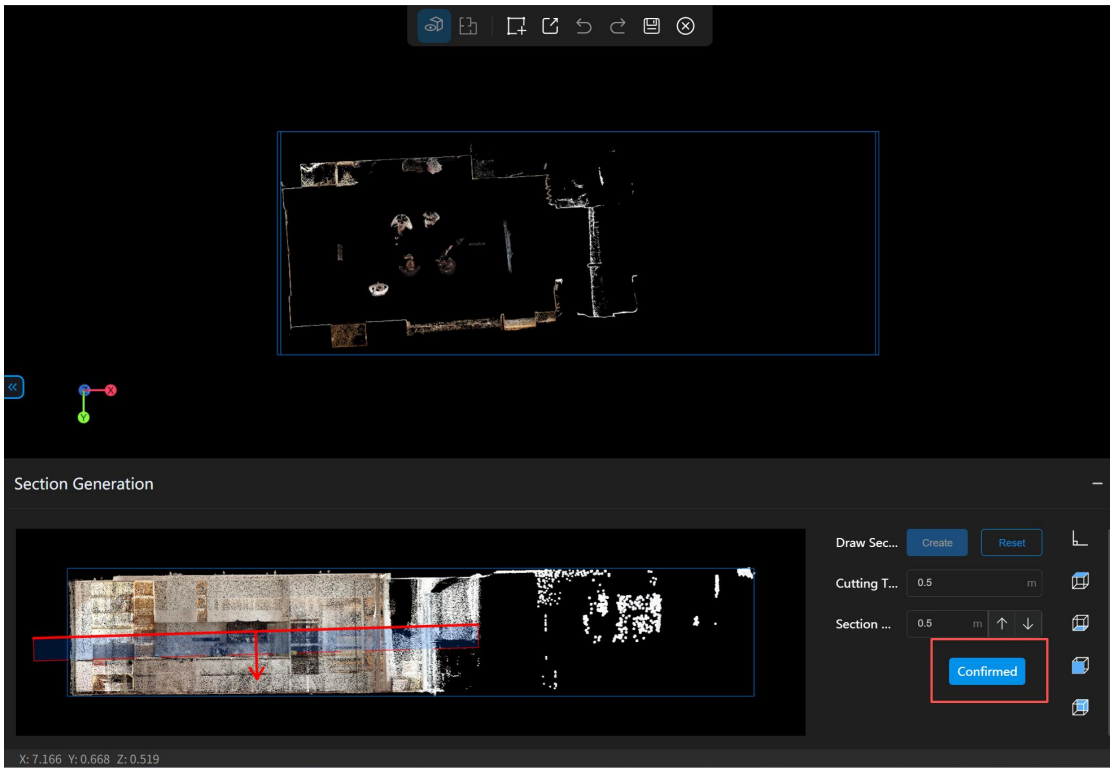


Fig 9-54 Generated Section Vectors

9.7.3. Plane Generation

Plane Generation intelligently segments the point cloud into independent planes and constructs candidate surfaces for architectural spaces.

Click **Plane Generation** to open the **Generation Settings** dialog box, as shown below.

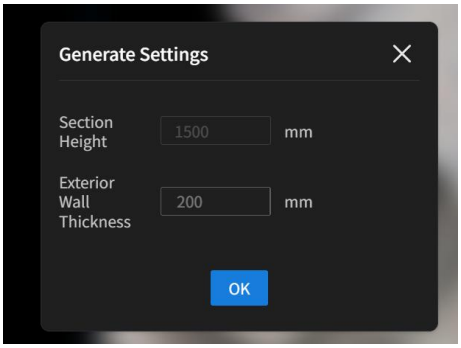


Fig 9-55 Generation Settings Parameters

You can adjust parameters such as **Exterior Wall Thickness**. After adjustment, click OK to execute plane generation. You will need to wait for a while, and the progress is displayed at the bottom.

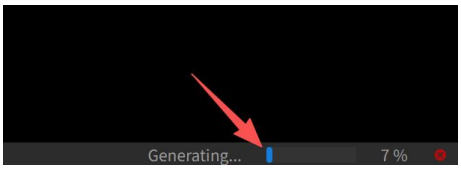


Fig 9-56 Plane Generation Progress

After processing is completed, the plane generation result is displayed. You can later enter **Edit and Draw** to edit the generated vectors.

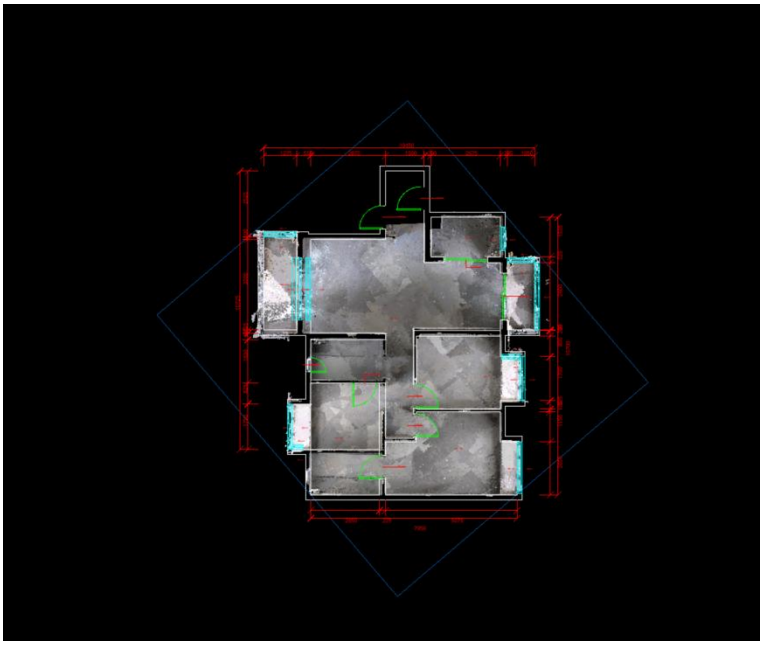


Fig 9-57 Plane Generation Result

9.7.4. Edit and Draw

Click **Edit and Draw** in the drafting tool group at the top to enter the drawing-editing interface. The **Edit and Draw** panel then appears on the right, where you can perform graphic drawing, graphic editing, and annotation operations.

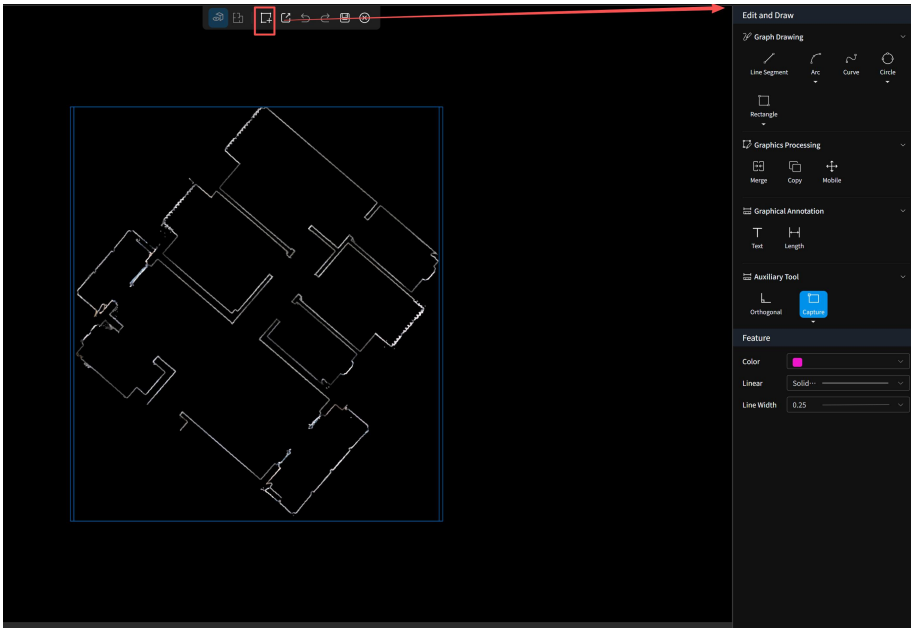


Fig 9-58 Entering the Drawing Interface

9.7.4.1. Graphic Drawing

9.7.4.1.1. Line Segment

Line Segment is used to draw line entities. The steps are as follows:

In the [**Drafting Tools**] panel, click **Line Segment** in the graphic drawing area. The button is highlighted to indicate activation.

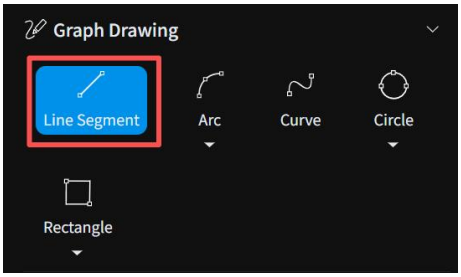


Fig 9-59 Activating the Line Segment Tool

Move the pointer to the view area. Following the cursor prompt, left-click to add the vertices of the line segment one by one. **Right-click** to finish drawing the segment.

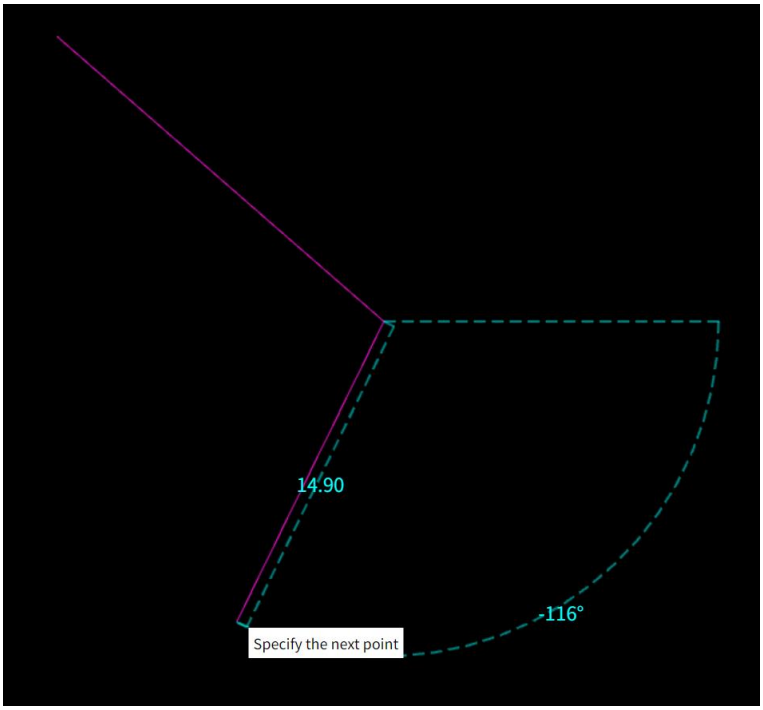


Fig 9-60 Drawing a Line Segment

Repeat the steps above to draw other line segments.

9.7.4.1.2. Arc

9.7.4.1.2.1. Three-Point Arc

A **Three-Point Arc** is drawn by specifying three non-collinear points. The steps are as follows:

In the [**Drafting Tools**] panel, click the expand button under **Arc**, then click **Three-Point Arc** to activate the function.

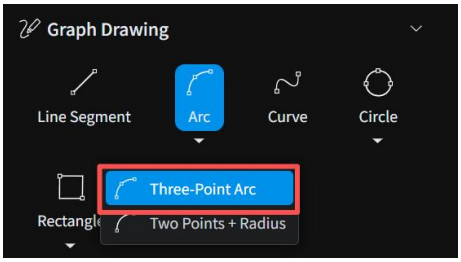


Fig 9-61 Activating the Three-Point Arc Tool

Move the pointer to the view area. Following the cursor prompt, left-click to add three non-collinear points one by one. After all three points are added, an arc is generated automatically.

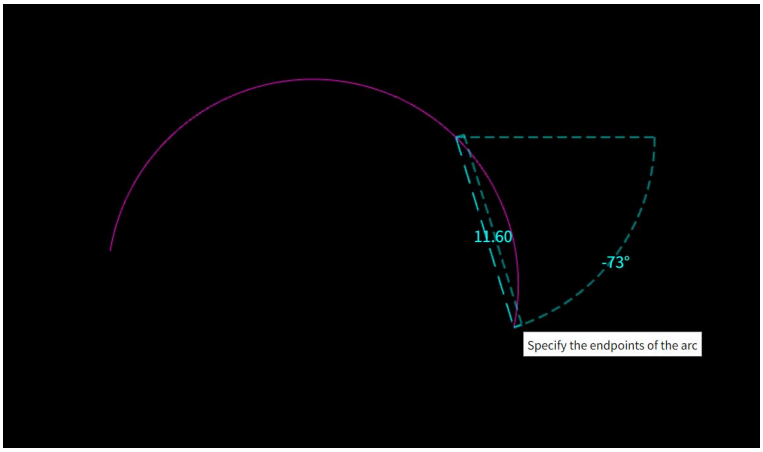


Fig 9-62 Drawing a Three-Point Arc

Repeat the steps above to draw other arcs.

9.7.4.1.2.2. Two Points + Radius (Arc)

Two Points + Radius (Arc) means first specifying the two end points of the arc, and then determining the center of the circle on which the arc lies. The steps are as follows:

In the [**Drafting Tools**] panel, click the expand button under **Arc**, then click **Two Points + Radius (Arc)** to activate the function.

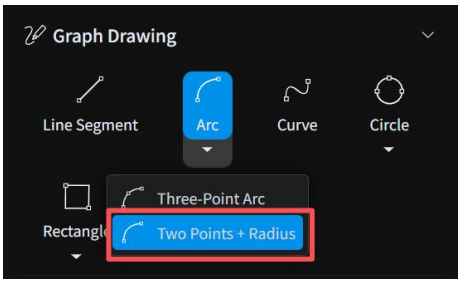


Fig 9-63 Activating the Two Points + Radius Arc Tool

Move the pointer to the view area. Following the cursor prompt, left-click to add two points as the arc endpoints, then move the pointer to determine the center of the circle and left-click again to generate the arc.

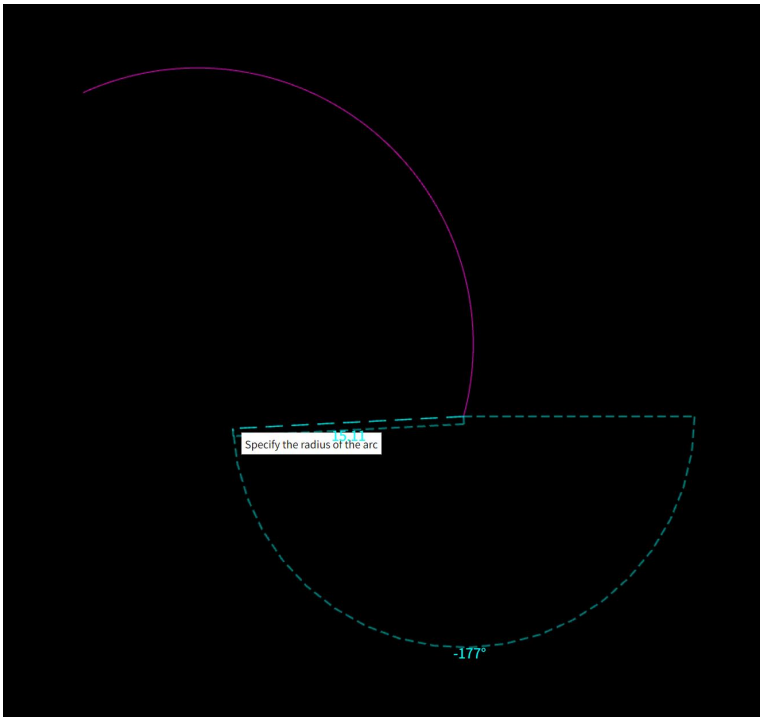


Fig 9-64 Drawing a Two Points + Radius Arc

Repeat the steps above to draw other arcs.

9.7.4.1.3. Curve

A **Curve** is created by drawing a series of points and fitting them into a curve. The steps are as follows:

In the [**Drafting Tools**] panel, click **Curve** in the graphic drawing area. The button is highlighted to indicate activation.

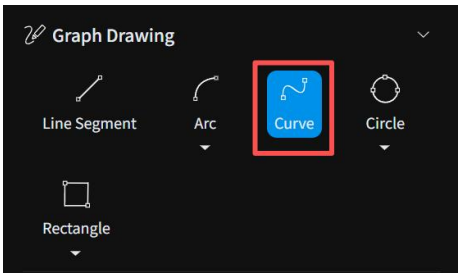


Fig 9-65 Activating the Curve Tool

Move the pointer to the view area. Following the cursor prompt, left-click to add points. As you move the pointer, the shape of the curve changes accordingly. Continue clicking to draw the curve, and right-click to finish.



Fig 9-66 Drawing a Curve

Repeat the steps above to draw other curves.

9.7.4.1.4. Circle

9.7.4.1.4.1. Three-Point Circle

A **Three-Point Circle** is drawn by specifying three points on the circumference. The steps are as follows:

In the [**Drafting Tools**] panel, click the expand button under **Circle**, then click **Three-Point Circle** to activate the function.

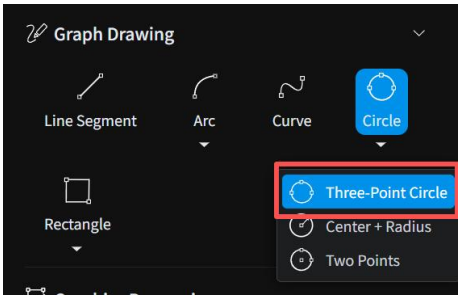


Fig 9-67 Activating the Three-Point Circle Tool

Move the pointer to the view area. Following the cursor prompt, left-click to add three non-collinear points one by one. After all points are added, a circle is generated automatically.

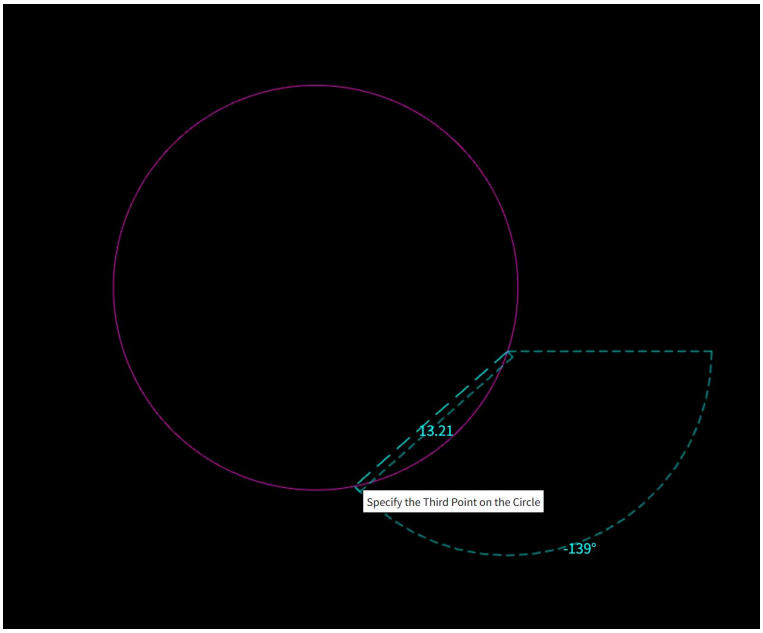


Fig 9-68 Drawing a Three-Point Circle

Repeat the steps above to draw other circles.

9.7.4.1.4.2. Center + Radius (Circle)

Center + Radius (Circle) draws a circle by using two points to determine the center position and radius. The steps are as follows:

In the [**Drafting Tools**] panel, click the expand button under **Circle**, then click **Center + Radius (Circle)** to activate the function.

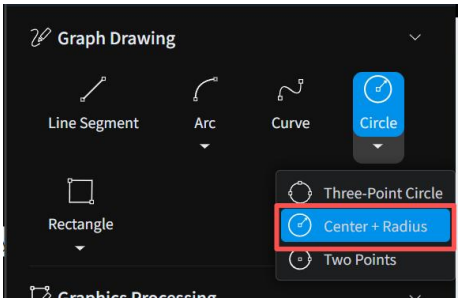


Fig 9-69 Activating the Center + Radius Circle Tool

Move the pointer to the view area. Following the cursor prompt, left-click to determine the center. As you move the pointer, a dashed line is shown between the first point and the current pointer position, and a circle is fitted with the dashed line as the radius. **Left-click** again to complete the circle.

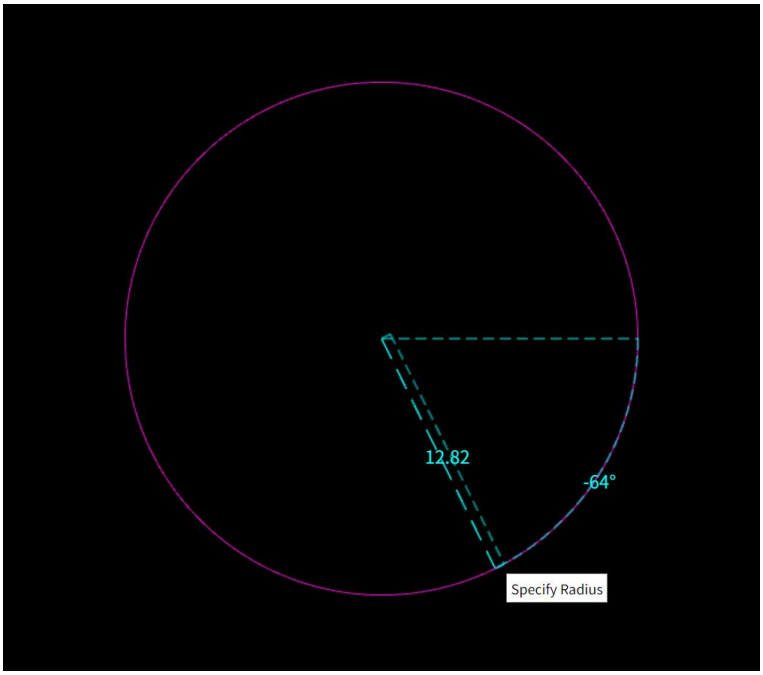


Fig 9-70 Drawing a Center + Radius Circle

Repeat the steps above to draw other circles.

9.7.4.1.4.3. Two-Point Circle

A **Two-Point Circle** is drawn by specifying the diameter of the circle. The steps are as follows:

In the [**Drafting Tools**] panel, click the expand button under **Circle**, then click **Two-Point Circle** to activate the function.

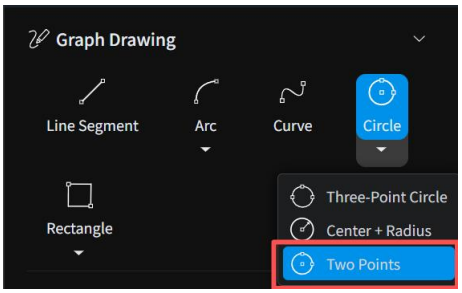


Fig 9-71 Activating the Two-Point Circle Tool

Move the pointer to the view area. Following the cursor prompt, left-click to determine the first point on the diameter, move the pointer to determine the other position on the diameter, and click again to complete the circle.

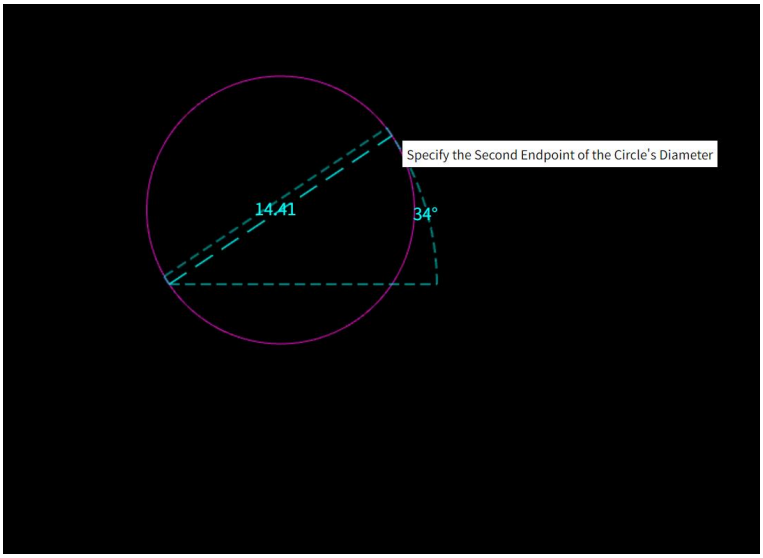


Fig 9-72 Drawing a Two-Point Circle

Repeat the steps above to draw other circles.

9.7.4.1.5. Rectangle

9.7.4.1.5.1. Two-Point Rectangle

A **Two-Point Rectangle** is drawn by specifying two diagonal points of the rectangle. The steps are as follows:

In the [**Drafting Tools**] panel, click the expand button under **Rectangle**, then click **Two-Point Rectangle** to activate the function.

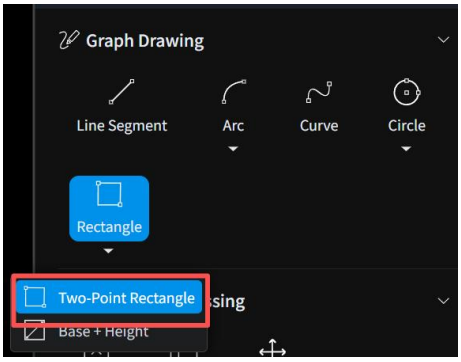


Fig 9-73 Activating the Two-Point Rectangle Tool

Move the pointer to the view area. Following the cursor prompt, left-click to determine the first diagonal point of the rectangle, move the pointer to determine the other diagonal point, and click again to complete the rectangle.

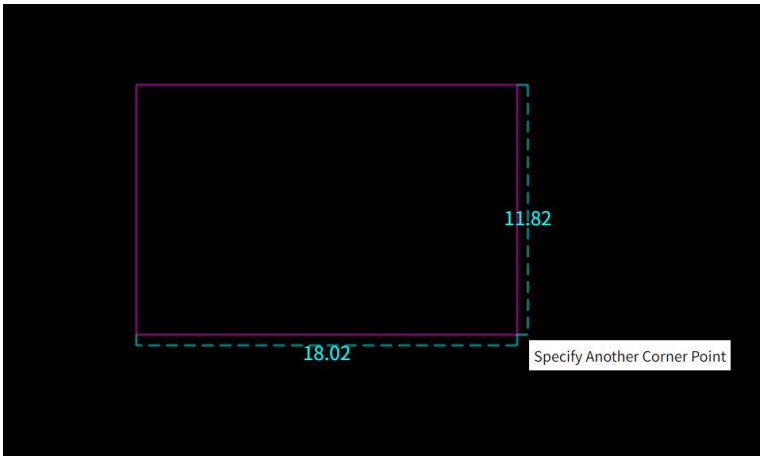


Fig 9-74 Drawing a Two-Point Rectangle

Repeat the steps above to draw other rectangles.

9.7.4.1.5.2. Base + Height (Rectangle)

Base + Height (Rectangle) draws a rectangle by first drawing its base and then controlling its height. The steps are as follows:

In the [**Drafting Tools**] panel, click the expand button under **Rectangle**, then click **Base + Height (Rectangle)** to activate the function.

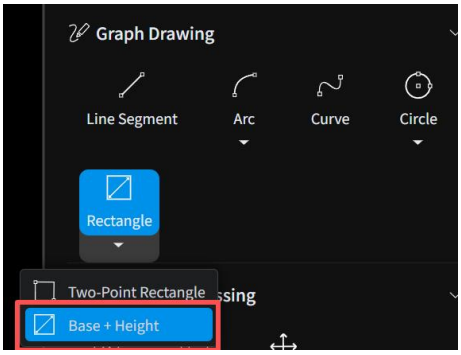


Fig 9-75 Activating the Base + Height Rectangle Tool

Move the pointer to the view area. Following the cursor prompt, left-click to draw the first point of the rectangle base, move the pointer and left-click again to determine the second base point. Then move the pointer to determine the height of the rectangle and click to finish.

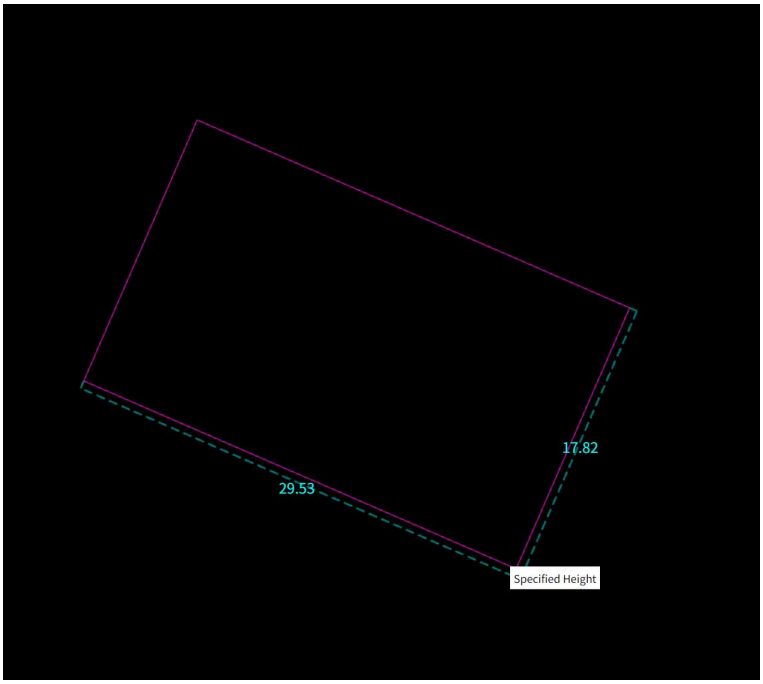


Fig 9-76 Drawing a Base + Height Rectangle

Repeat the steps above to draw other rectangles.

9.7.4.2. Graphic Editing

9.7.4.2.1. Merge

The **Merge** operation combines several continuously connected vector entities into a single entity. The steps are as follows:

In the [**Drafting Tools**] panel, click **Merge** in the graphic editing area. The button is highlighted to indicate activation.

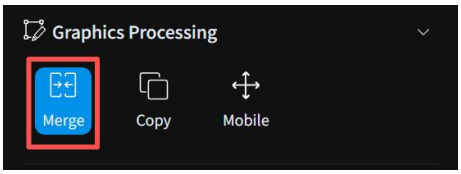


Fig 9-77 Activating Merge

Move the pointer to the view area. While holding down **Ctrl**, move the cursor to each entity to be merged and left-click to select it. The cursor displays the number of selected entities.

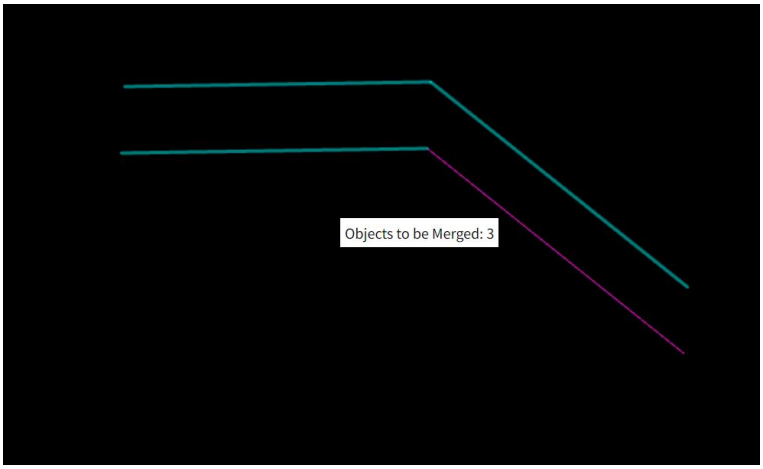


Fig 9-78 Selecting Objects to Merge

After the selection is completed, right-click to finish. If the entities are continuously connected, they are merged into one entity.

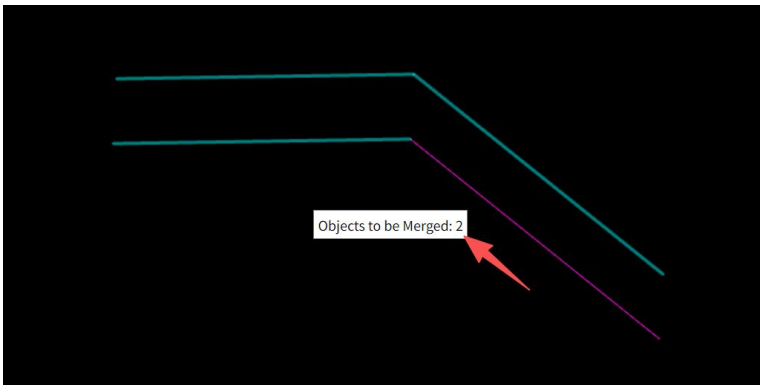


Fig 9-79 Merged Object

Repeat the steps above to continue performing merge operations.

9.7.4.2.2. Copy

The **Copy** operation duplicates one or more entities to avoid redrawing the same elements and improve drafting efficiency. The steps are as follows:

In the [**Drafting Tools**] panel, click **Copy** in the graphic editing area. The button is highlighted to indicate activation.

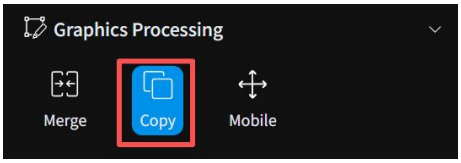


Fig 9-80 Activating Copy

Move the pointer to the view area. Following the cursor prompt, left-click to select the entity or entities to copy. You can hold down **Ctrl** to select multiple entities. **Right-click** to finish the selection.

After the entities are selected, left-click to define the base point for copying, move the pointer to determine the copy location, and right-click to complete the copy operation.

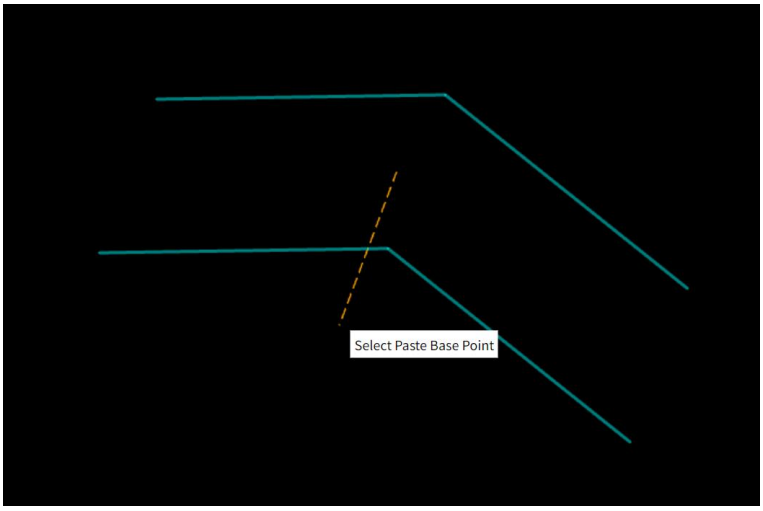


Fig 9-81 Copy Operation

Repeat the steps above to continue copying.

9.7.4.2.3. Move

The **Move** operation moves one or more entities to another location. The steps are as follows:

In the [**Drafting Tools**] panel, click **Move** in the graphic editing area. The button is highlighted to indicate activation.

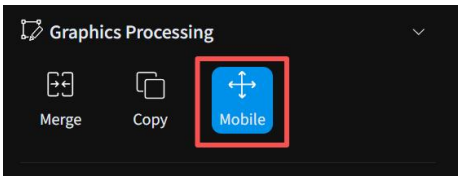


Fig 9-82 Activating Move

Move the pointer to the view area. Following the cursor prompt, left-click to select the entity or entities to move. You can hold down **Ctrl** to select multiple entities. **Right-click** to finish the selection.

After the entities are selected, left-click to define the base point for moving, move the pointer to determine the target position, and right-click to complete the move operation.

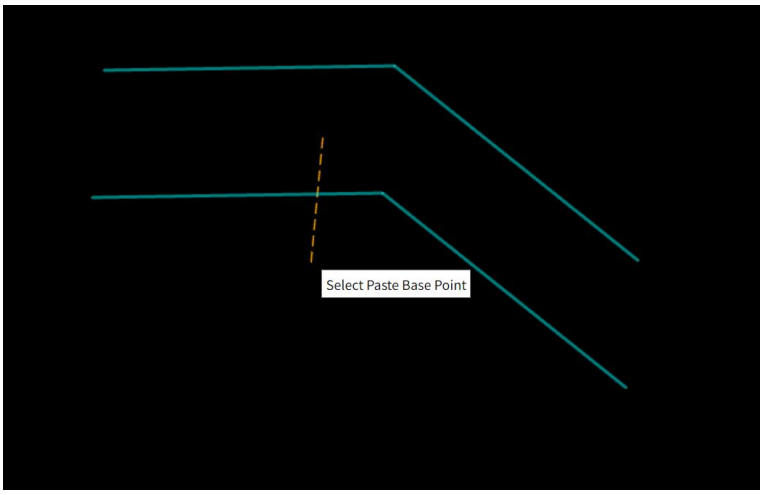


Fig 9-83 Move Operation

Repeat the steps above to continue moving.

9.7.4.2.4. Delete

To delete an entity, select it and press the **Delete** key on the keyboard. Multi-selection and batch deletion are supported.

9.7.4.3. Annotations

9.7.4.3.1. Text

Creates a text annotation entity. The steps are as follows:

In the [**Drafting Tools**] panel, click Text in the annotation area. The button is highlighted to indicate activation.

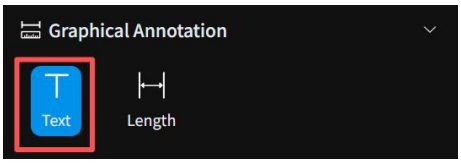


Fig 9-84 Activating Text

2. Move the pointer to the view area and, following the cursor prompt, left-click to define the width of the text box.

3. After the text width is defined, enter the text content and press **Enter** to finish input.



Fig 9-85 Drawing a Text Annotation

4. Repeat the steps above to create other text annotations.

9.7.4.3.2. Length

Length annotation displays the length between two points. The steps are as follows:

In the [**Drafting Tools**] panel, click **Length** in the annotation area. The button is highlighted to indicate activation.

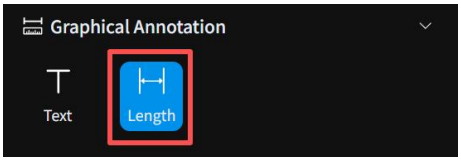


Fig 9-86 Activating Length Annotation

Move the pointer to the view area. Following the cursor prompt, left-click to determine the starting extension line of the dimension, move the pointer to determine the ending limit position, and click again.

Move the pointer to determine the position of the dimension line, then left-click to finish.

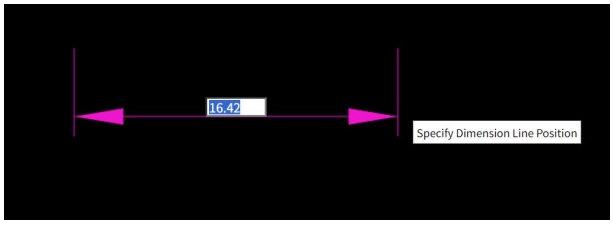


Fig 9-87 Drawing a Length Annotation

Repeat the steps above to create other length annotations.

9.7.4.4. Auxiliary Functions

9.7.4.4.1. Orthogonal Mode (On)

By default, **Orthogonal** is off. When it is turned on, the cursor is constrained to move only horizontally or vertically while drawing, which makes it easier to create horizontal or vertical lines quickly.

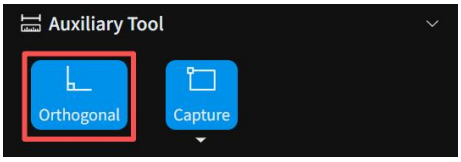


Fig 9-88 Enabling Orthogonal Mode

9.7.4.4.2. Snap (On)

By default, **Snap** is on, but it can be turned off. When enabled, it assists users in drawing graphics. Supported snap elements include endpoints, midpoints, nodes, circle centers, and nearest points.

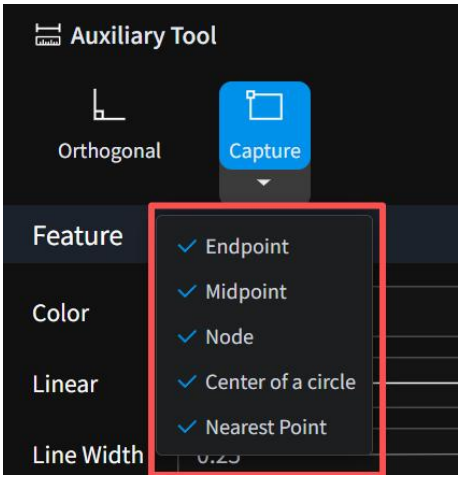


Fig 9-89 Snap Options

9.7.5. Drawing Export

The drawn vectors can be exported as drawing data in **DXF** format.

Click **Generate Drawing** to open the **Drawing Export** settings dialog box, as shown below.

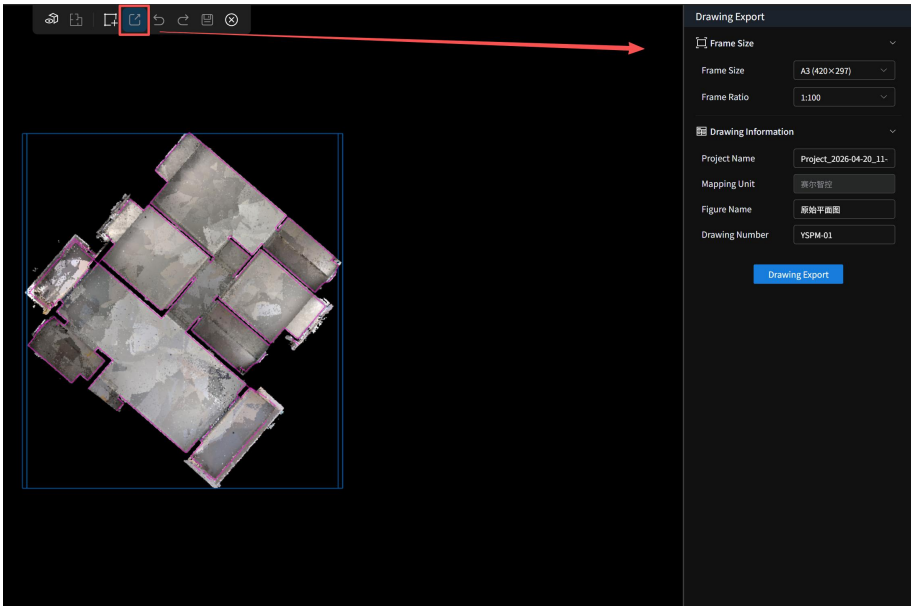


Fig 9-90 Drawing Export Settings

Set the drawing frame size and drawing information. After the settings are completed, click **Drawing Export**. In the dialog box that appears, set the export file name and storage path, then click **OK** to execute the export.

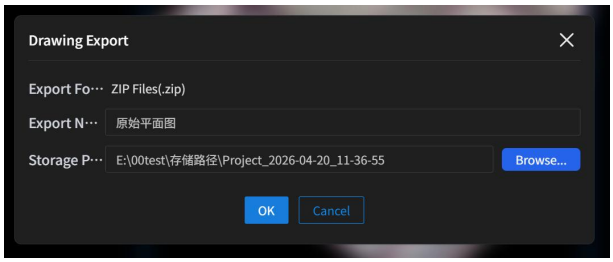


Fig 9-91 Export File Settings

After the export succeeds, unzip the **ZIP** file. The result can then be opened in third-party software as shown below.

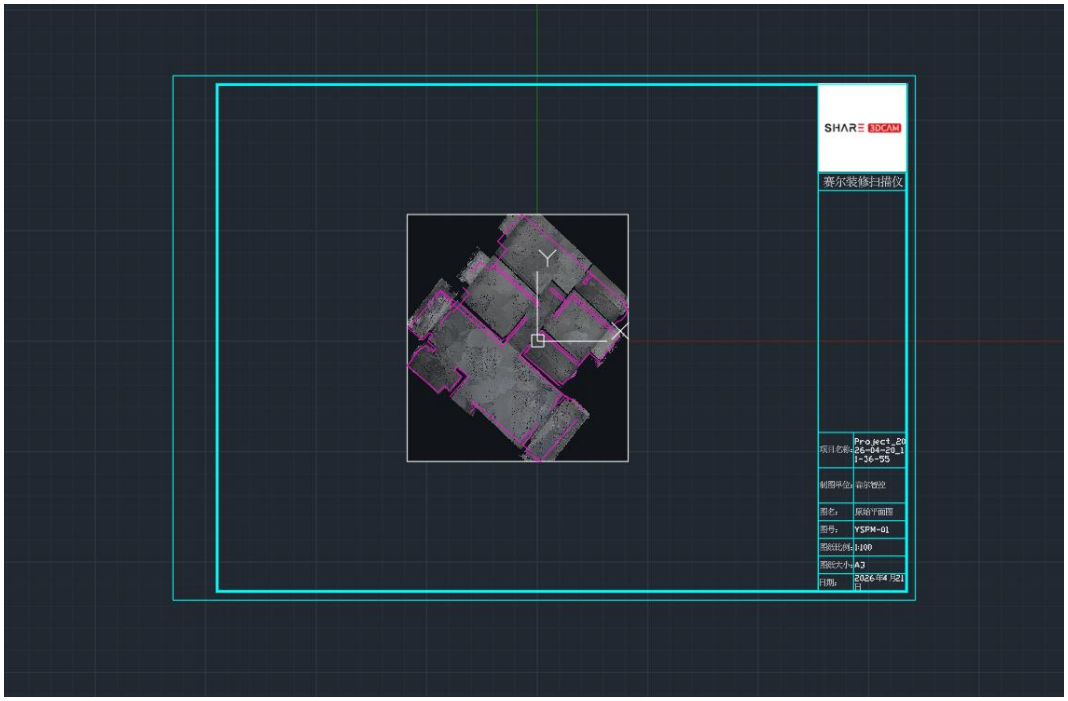


Fig 9-92 Export Result Example

9.7.6. Undo / Redo

During drawing, you can undo the previous step (**Ctrl + Z**) and continue undoing multiple steps in sequence. You can also redo undone content (**Ctrl + Y**), also in sequence.

For an entity that is currently being drawn, the number of undo/redo operations is not limited, except that the first point cannot be undone. After drawing is completed, up to 20 drawn entities can be undone or redone.

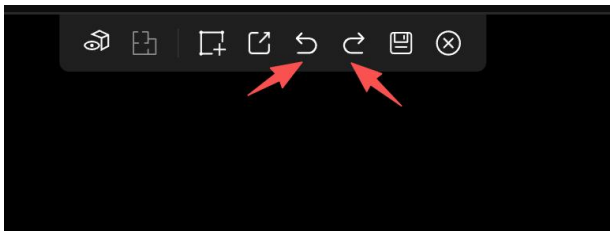


Fig 9-93 Undo / Redo

9.7.7. Save

During drawing, or after drawing is completed, save or update the drawn vector file in the vector-file node of the directory tree.



Fig 9-94 Save

9.7.8. Exit

Click **Exit** to leave the **CAD Drafting** function.

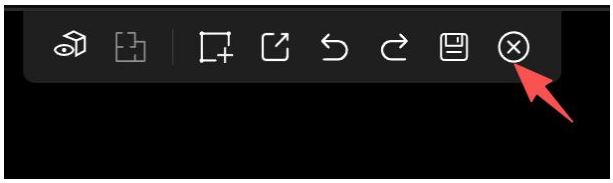


Fig 9-95 Exit CAD Drafting

If you exit **CAD Drafting** without saving the drawing content, a prompt appears and asks whether to save.

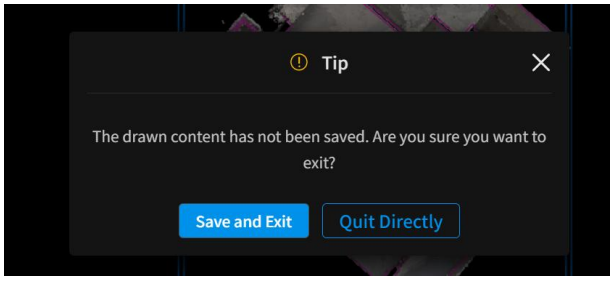


Fig 9-96 Unsaved Changes Prompt

9.8. Section Extraction

Section Extraction is used to quickly extract and save multiple slices of a point cloud in the same direction. Select a single point cloud, then click **Section Extraction** in the main function area to activate the function. After activation, the **Section Extraction** operation panel appears on the right.

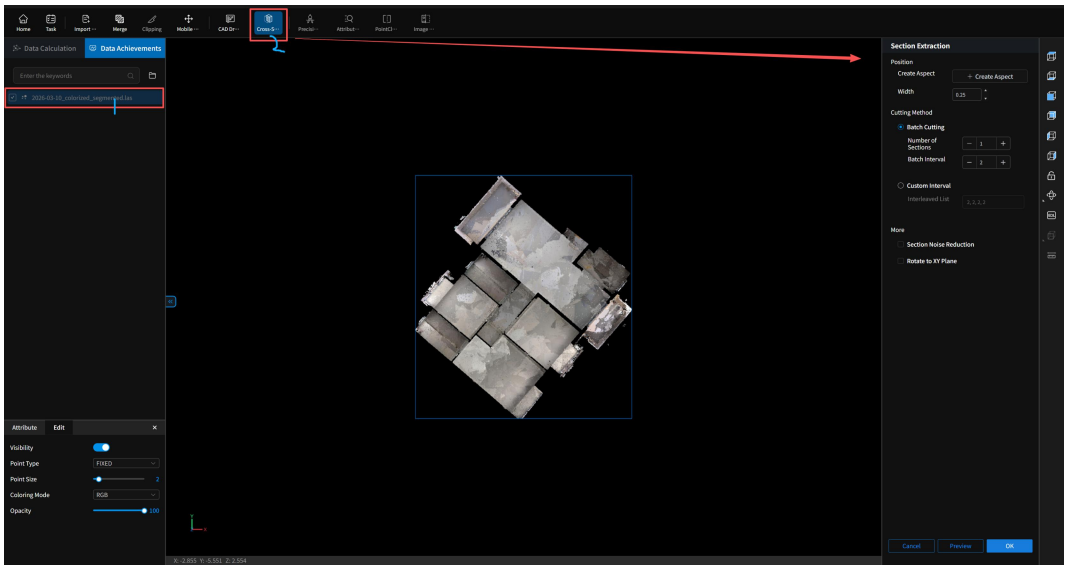


Fig 9-97 Activating Section Extraction

The workflow is as follows:

1. Determine the cut direction.
2. Create the section position.
3. Set section parameters such as thickness, quantity, and spacing.
4. Preview the cut result.
5. Execute Section Extraction.

The following content describes these steps in detail.

9.8.1. Determine the Cutting Direction

After **Section Extraction** is activated, you can determine the point cloud cutting direction by rotating the scene with the mouse, clicking the **View Control buttons** on the side toolbar, or entering the Cut Direction manually.

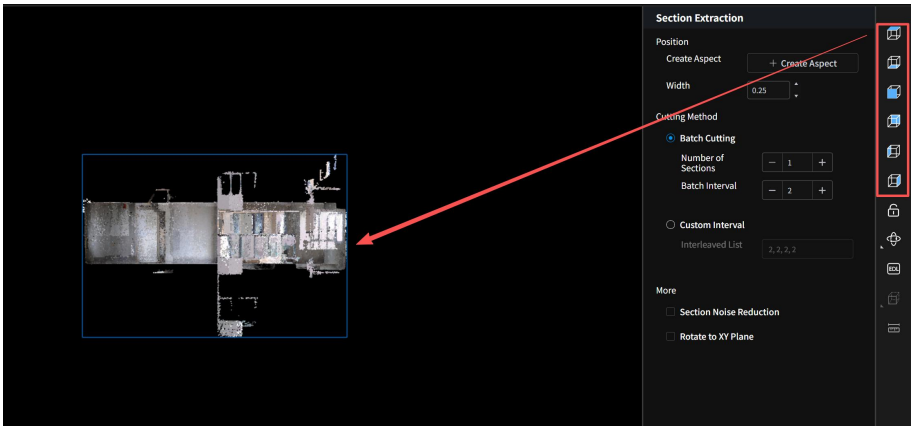


Fig 9-98 Determining the Cutting Direction

9.8.2. Create the Section Position

In the **Section Extraction** panel, click **Create Aspect** to activate the section creation function.

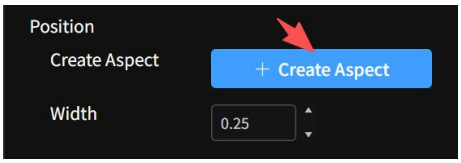


Fig 9-99 Activating Section Creation

Move the pointer into the scene. First, left-click to add two points to determine the section direction. Then move the pointer to determine the section width and left-click again to complete section creation.

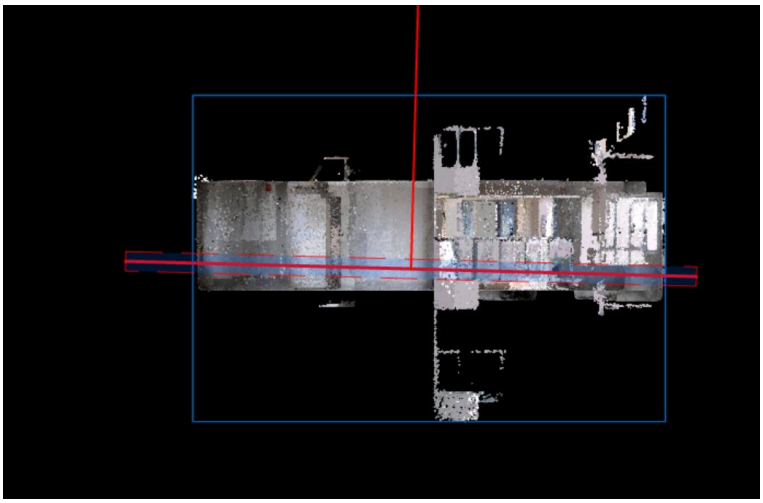


Fig 9-100 Creating a Section

If you are not satisfied with the drawn section direction, click **Create Aspect** to clear the current section. Click it again to redraw.

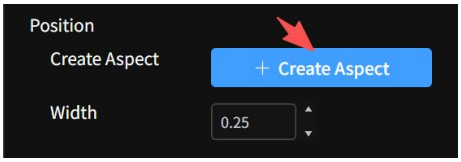


Fig 9-101 Clearing the Drawn Section

9.8.3. Set Section Parameters (Thickness, Quantity, Spacing, etc.)

After the section is created successfully, you can dynamically adjust the section width in the **Section Extraction** panel. The width must not exceed 10 m.



Fig 9-102 Adjusting Section Width

The default cut mode is **Batch Cutting**. You can adjust the number of sections and the batch spacing.

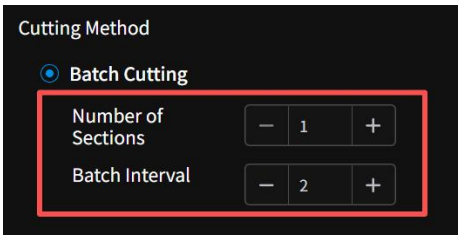


Fig 9-103 Adjusting Batch Cutting Parameters

You can also choose Custom Interval and specify the spacing between sections in the interval list, separated by commas.

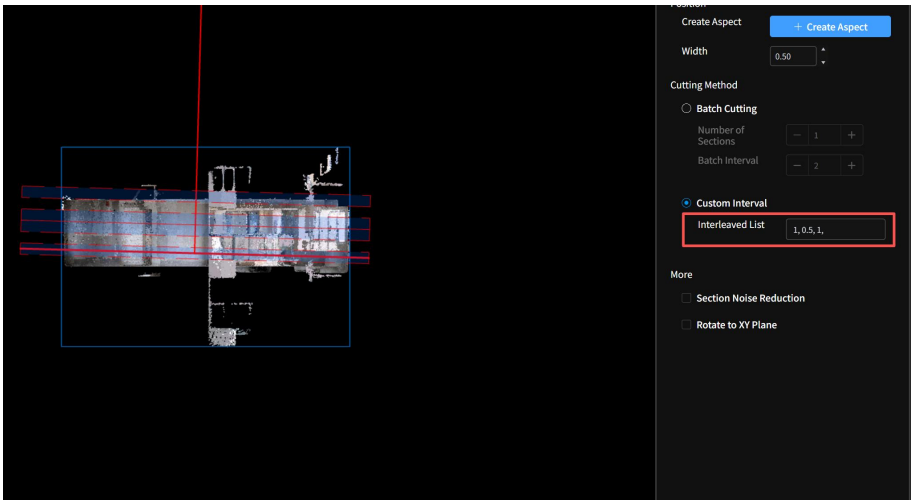


Fig 9-104 Custom Section Intervals

9.8.4. Preview the Section Result (Optional)

After completing the steps above, click **Preview** at the bottom of the **Section Extraction** panel to preview the cut result.

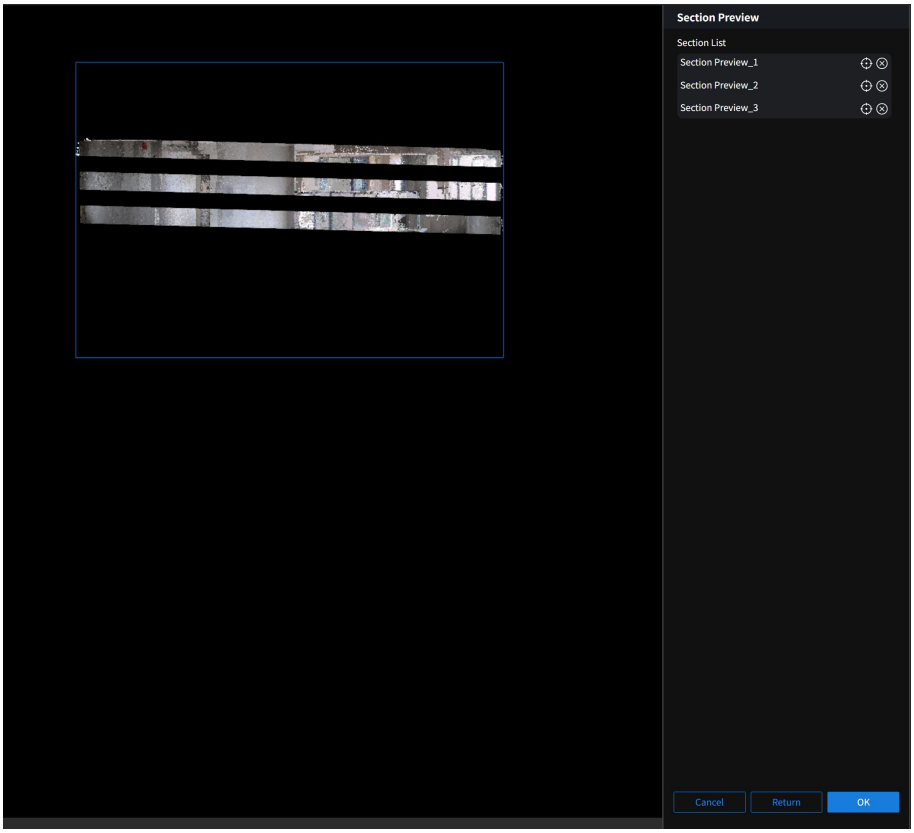


Fig 9-105 Section Preview

9.8.5. Execute Section Extraction

Click **OK** at the bottom of the **Section Extraction** panel to execute the section extraction operation.

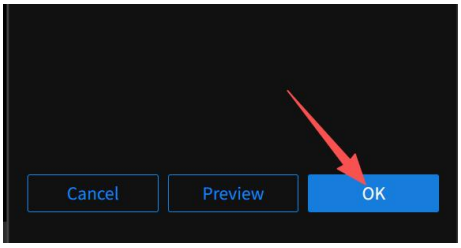


Fig 9-106 Executing Section Extraction

After the extraction is completed, the extracted section data is added to the directory tree of the [**Data Management**] panel.

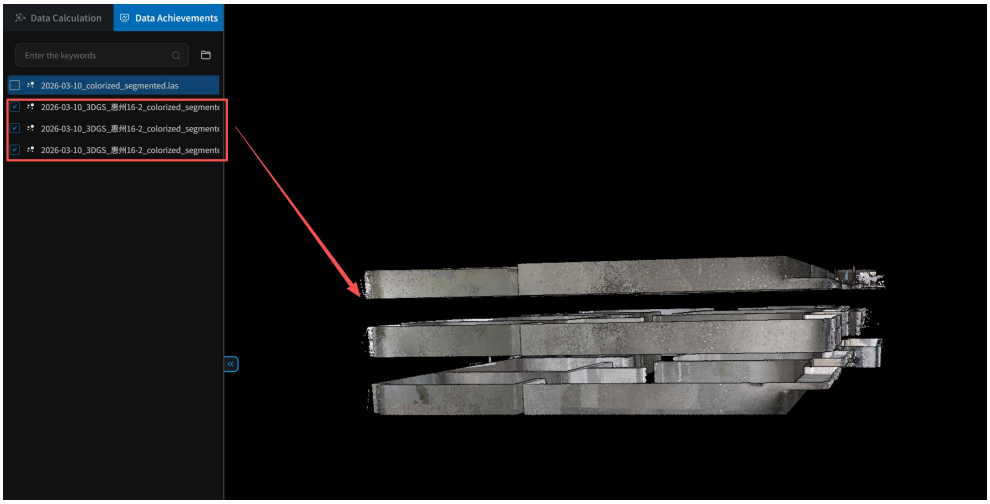


Fig 9-107 Section Data

9.9. Accuracy Check

Point Cloud Accuracy Check is mainly used to verify the accuracy of scan data. It primarily compares the coordinates of inspection points in point cloud data that has been transformed with **RTK** or control points against their corresponding true coordinates.

Click **Accuracy Check** in the **Function Area** to open the **Accuracy Check** dialog box, which provides two modes: **3D Accuracy Check** and **Elevation Accuracy Check**.

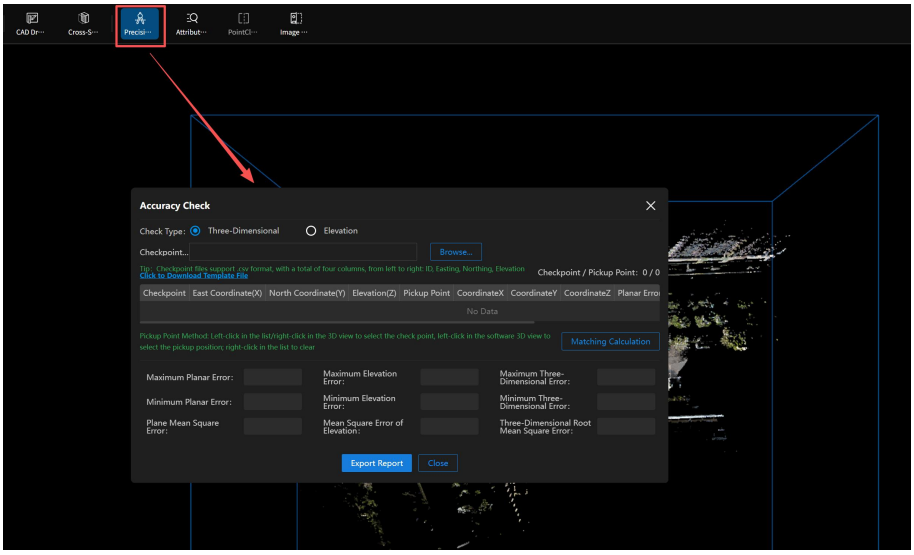


Fig 9-108 Accuracy Inspection Dialog

9.9.1. 3D Accuracy Check

The default inspection type is **3D Accuracy Check**. The operation steps are as follows:

Add an checkpoint file. Click **Browse...** to the right of the **Checkpoint File** field to add an inspection-point file. Only **CSV** format is supported. After the file is added successfully, the inspection points are displayed in the scene.

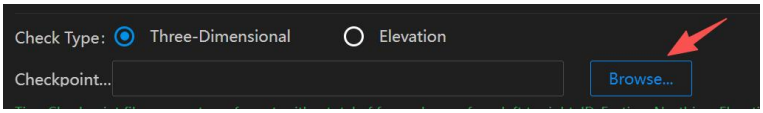


Fig 9-109 Adding an Inspection Point File



Fig 9-110 Inspection Points Displayed in the Scene

Note: Users can prepare the inspection-point file based on the downloaded template file. Click **Download Template File** at the bottom of this option to download the template.

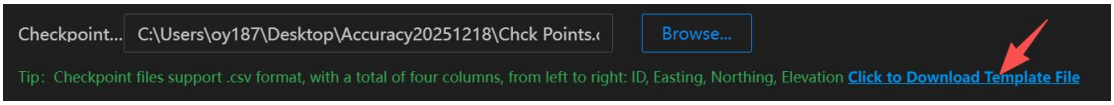


Fig 9-111 Downloading the Inspection Point Template

Add picked points. Click a record in the inspection-point list to select it. You can double-click it or click **Zoom To** at the top of the list to move near that inspection point. The selected inspection point is shown in green in the 3D scene.

At this time, left-click in the scene to add the corresponding picked point. Picked points are shown in yellow in the 3D scene.

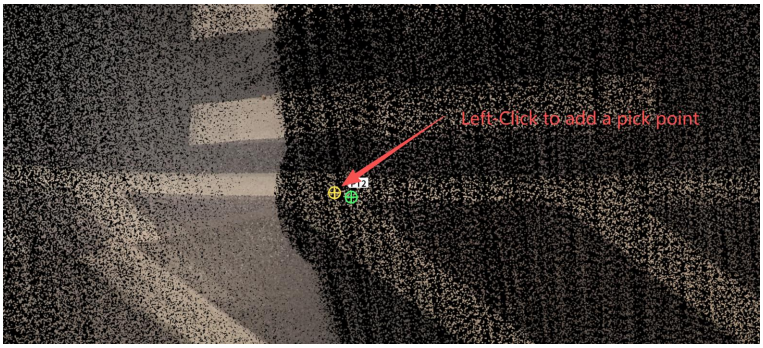


Fig 9-112 Adding a Picked Point

Repeat this process until all picked points have been added. You can right-click in the inspection-point list and choose **Clear Picked Point** or **Clear All Picked Points** to remove them.

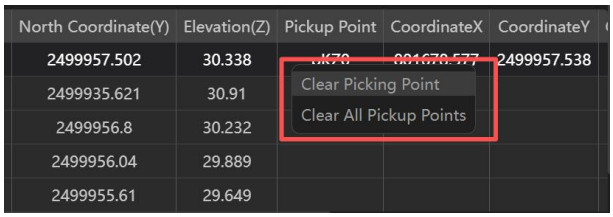


Fig 9-113 Clearing Picked Points

Matching calculation. Click **Matching Calculation** to calculate the 3D accuracy of the inspection points. The calculation results are displayed at the bottom of the panel.

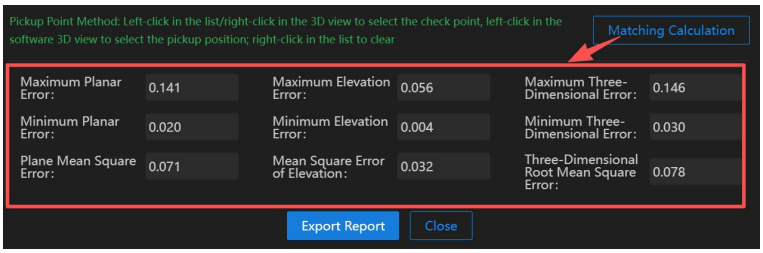


Fig 9-114 3D Accuracy Inspection Result

Click **Export Report** at the bottom to export the accuracy inspection report.

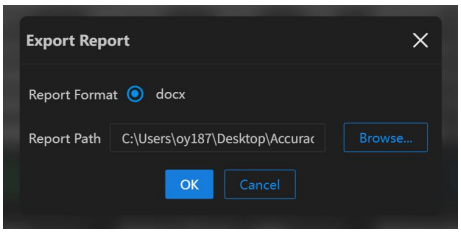
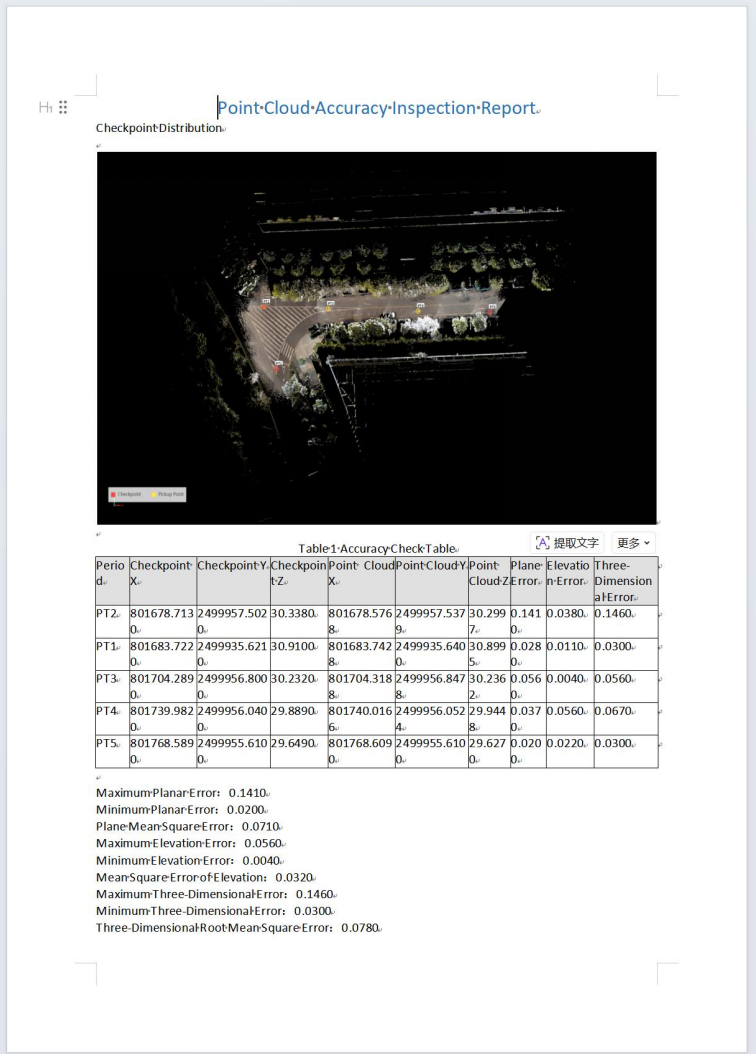


Fig 9-115 Export Report Dialog



Point Cloud Accuracy Inspection Report

Checkpoint Distribution

Table 1 Accuracy Check Table

Period	Checkpoint X	Checkpoint Y	Checkpoint Z	Point Cloud X	Point Cloud Y	Point Cloud Z	Plane Error	Elevation Error	Three-Dimensional Error
PT2	801678.7130	2499957.5020	30.3380	801678.5769	2499957.5379	30.2997	0.1410	0.0380	0.1460
PT1	801683.7220	2499935.6210	30.9100	801683.7428	2499935.6405	30.8995	0.0280	0.0110	0.0300
PT3	801704.2890	2499956.8000	30.2320	801704.3188	2499956.8478	30.2362	0.0560	0.0040	0.0560
PT4	801739.9820	2499956.0400	29.8890	801740.0166	2499956.0524	29.9448	0.0370	0.0560	0.0670
PT5	801768.5890	2499955.6100	29.6490	801768.6090	2499955.6100	29.6270	0.0200	0.0220	0.0300

Maximum Planar Error: 0.1410
Minimum Planar Error: 0.0200
Plane Mean Square Error: 0.0710
Maximum Elevation Error: 0.0560
Minimum Elevation Error: 0.0040
Mean Square Error of Elevation: 0.0320
Maximum Three-Dimensional Error: 0.1460
Minimum Three-Dimensional Error: 0.0300
Three-Dimensional Root Mean Square Error: 0.0780

Fig 9-116 3D Accuracy Report Content

9.9.2. Elevation Accuracy Check

At the top of the dialog box, click **Elevation** to switch to **Elevation Accuracy Check**. The steps are as follows:

Add an checkpoint file. Click Select Path to the right of the **Checkpoint File** field to add the inspection-point file. Only **CSV** format is supported. Its content is the same as in **3D Accuracy Inspection**. See that section for details.



Fig 9-117 Adding an Inspection Point File

Obtain matching-point elevations and calculate. Set the **Matching Neighborhood** parameter. The default is 0.10 (range 0.1 to 1). Click **Matching**

Calculation and wait a moment to obtain the matching-point elevations and calculate elevation accuracy.

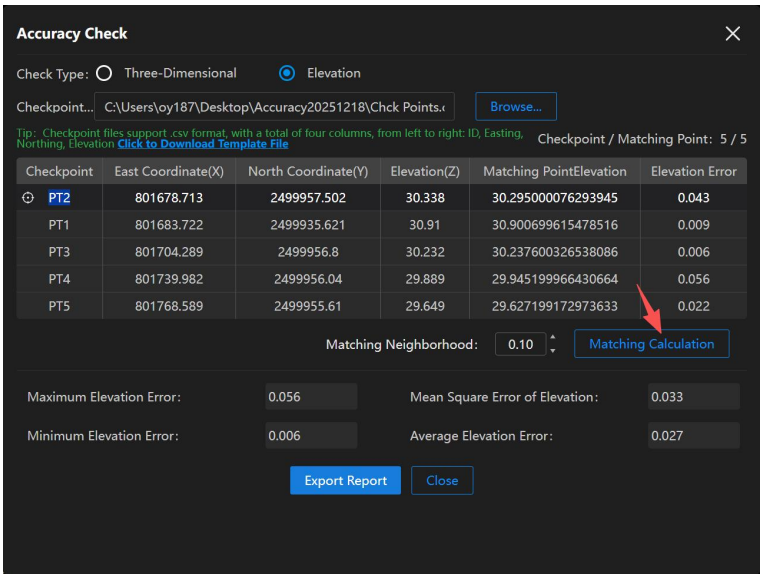


Fig 9-118 Matching Neighborhood Parameter and Matching Calculation Button

Click **Export Report** at the bottom to export the accuracy inspection report.

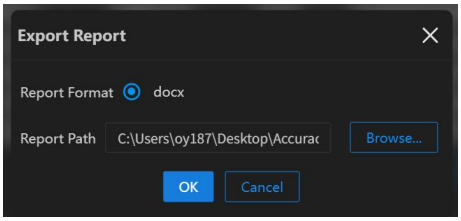


Fig 9-119 Export Report Dialog

Point Cloud Accuracy Inspection Report

Checkpoint Distribution

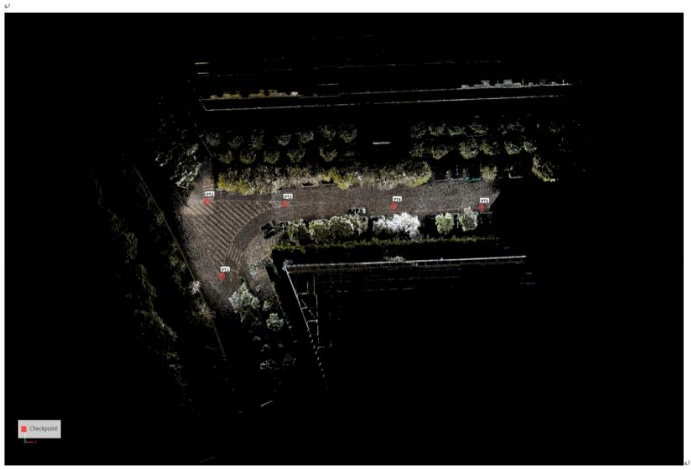


Table 1 Accuracy Check Table

Period	Checkpoint X	Checkpoint Y	Checkpoint Z	Match Elevation Z	Elevation Error
PT2	801678.7130	2499957.5020	30.3380	30.2950	0.0430
PT1	801683.7220	2499935.6210	30.9100	30.9007	0.0090
PT3	801704.2890	2499956.8000	30.2320	30.2376	0.0060
PT4	801739.9820	2499956.0400	29.8890	29.9452	0.0560
PT5	801768.5890	2499955.6100	29.6490	29.6272	0.0220

Maximum Elevation Error： 0.0560
Minimum Elevation Error： 0.0060
Mean Square Error of Elevation： 0.0330
Mean Square Error of Elevation： 0.0270

Fig 9-120 Elevation Accuracy Inspection Report Content

9.10. Attribute Query

Attribute Query is used to query the coordinate, class, RGB value, return, intensity, and other values of a point in the scene.

Click **Attribute Query** in the **Function Area** to activate the function. Move the pointer over the point cloud point to be queried in the scene and left-click to view its attribute information.

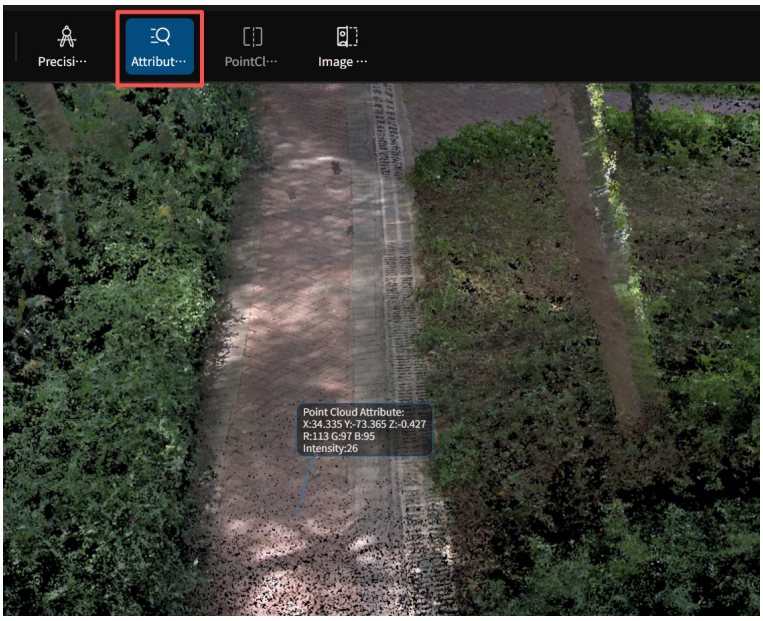


Fig 9-121 Point Cloud Attribute Query

Click **Attribute Query** again in the **Function Area** to exit this function.

9.11. Point Cloud Comparison

The **Point Cloud Comparison** function provides users with an efficient way to visually compare point cloud datasets. By synchronizing point cloud views in two windows, users can look for differences and similarities between different datasets.

Prerequisite: The two point clouds must use the same coordinate system. If their coordinates differ, complete Point Cloud Registration or Coordinate Transformation first. This function provides visual comparison only; it does not output quantitative deviations and must not be used alone as the basis for construction acceptance.

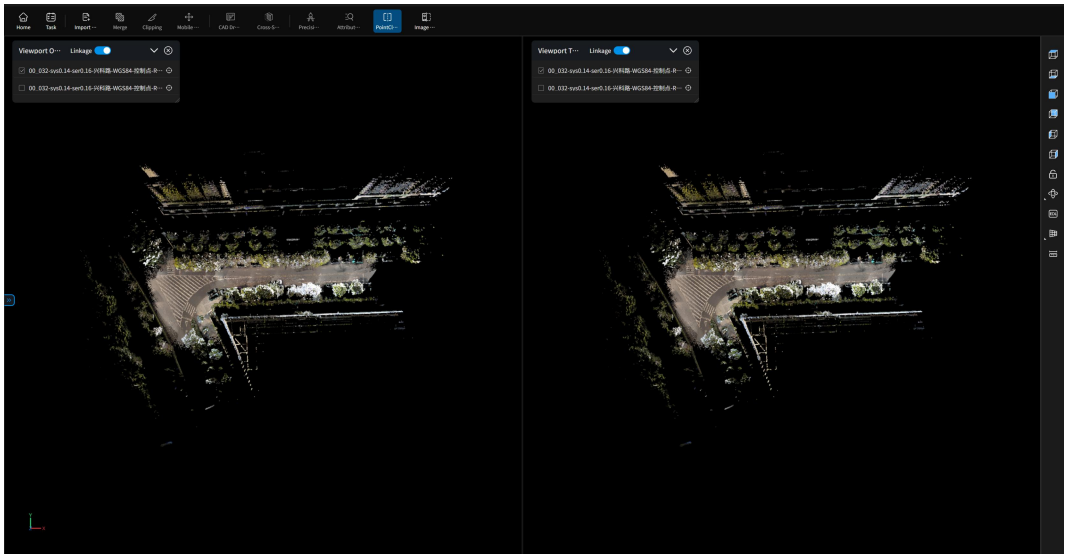


Fig 9-122 Point Cloud Comparison

9.11.1. Steps

9.11.1.1. Step 1: Open Point Cloud Comparison

Click **Point Cloud Comparison** in the function area to activate the feature. After activation, a **Viewport Control** window appears in the upper-left corner of each viewport.

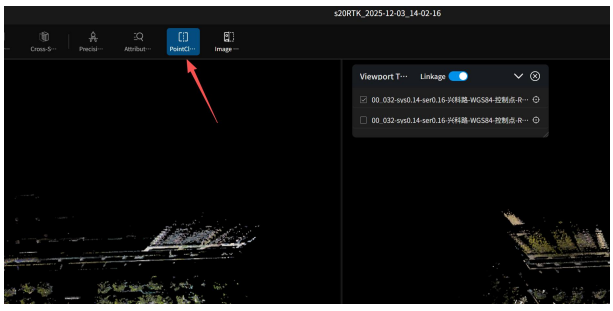


Fig 9-123 Activating Point Cloud Comparison

9.11.1.2. Step 2: Configure Point Cloud Comparison

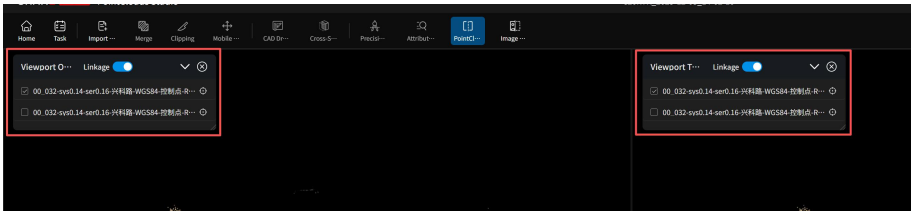


Fig 9-124 Viewport Settings Window

In the **Viewport Settings** window, you can configure the viewport linkage mode and whether the point cloud data is displayed in each viewport.

By default, Viewport 1 and Viewport 2 are linked. Rotation, pan, or zoom operations performed in either viewport are repeated automatically in the other viewport, allowing synchronized viewing. If the Linkage button is turned off, the point clouds in different viewports can be operated independently.

9.11.1.3. Step 3: View Point Cloud Comparison

When **Linkage** is on, move the pointer into either viewport and pan, rotate, or zoom the point cloud. The other viewport changes synchronously. You can also turn **Linkage** off and operate either viewport independently without affecting the other viewport.

9.11.1.4. Step 4: Exit Point Cloud Comparison

Click Point Cloud Comparison again in the main function area to exit the feature, or close the **Point Cloud Comparison Settings** dialog box.

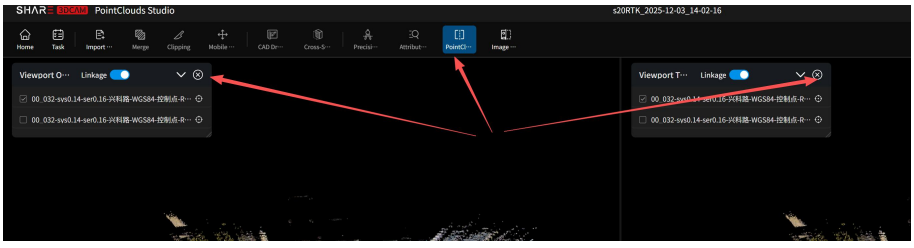


Fig 9-125 Exiting Point Cloud Comparison

9.11.2. Application Value

Quality inspection: Compare point cloud data from different phases of a construction project to check construction quality and progress.

Environmental monitoring: Compare terrain or vegetation coverage at different points in time to monitor environmental change.

Cultural heritage protection: Compare scan data of historical buildings at different times to assess condition changes and the effectiveness of preservation work.

9.12. Image Comparison

The **Image Comparison** function enables users to compare 3D point clouds, floor plans, and field photos in depth. This feature greatly enriches the user's toolkit for data analysis, site reproduction, and data verification.

Note: To use **Image Comparison**, the **Undistorted Photo Output** parameter must be enabled during data processing. See the Data Processing chapter for details.

Select a point cloud file in the **Data Management** directory tree and click **Image Comparison** to enter the **Image Comparison** interface, as shown below.

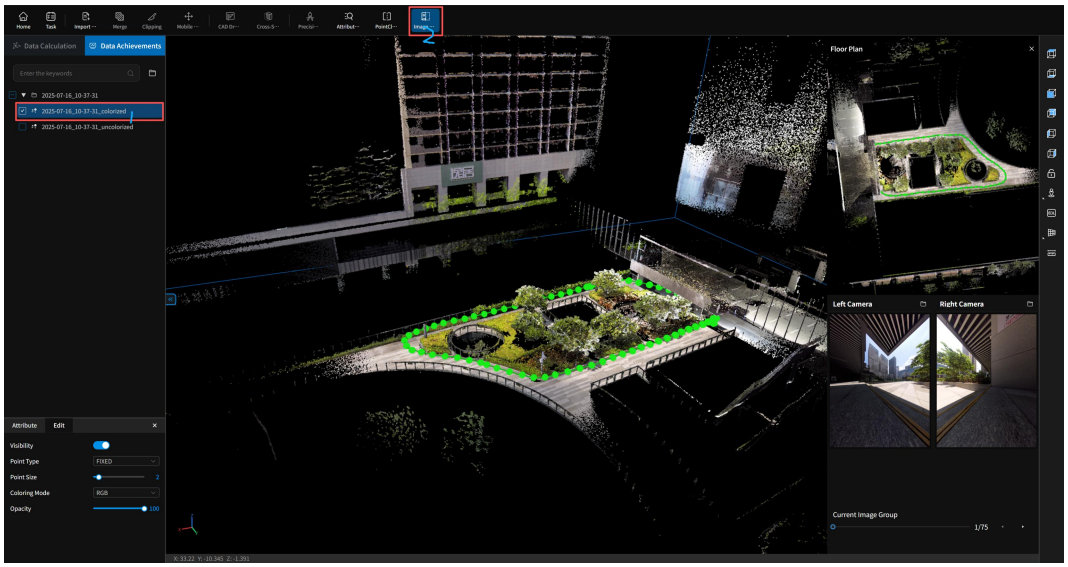


Fig 9-126 Image Comparison

The data is displayed in plan view from a top-down perspective, and the corresponding trajectory is overlaid. Clicking the plan also links with the 3D viewport.

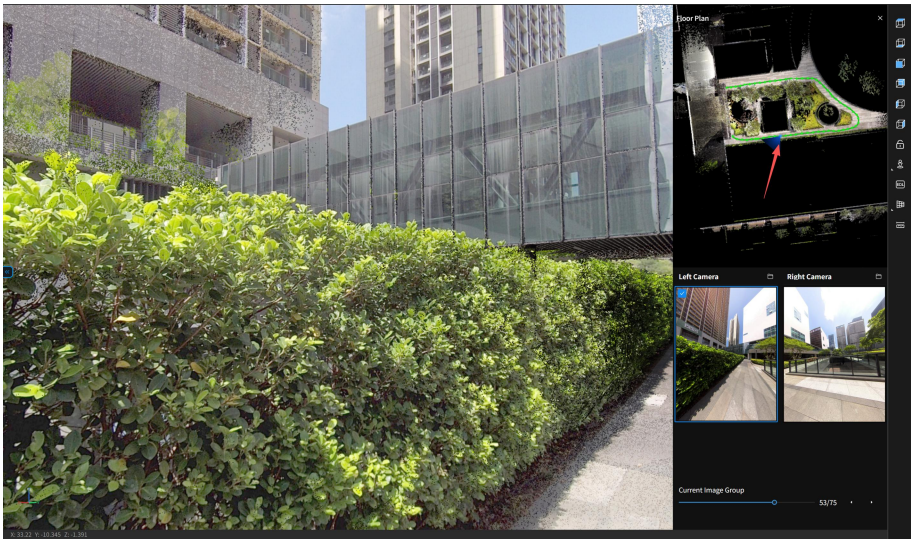


Fig 9-127 Click to Trigger Viewport Linkage

In the **Photo Display** window, you can switch between the previous and next captured frames. Clicking a photo links it with the 3D viewport and displays the corresponding viewing angle. Click the photo area again to hide the corresponding photo in the scene.

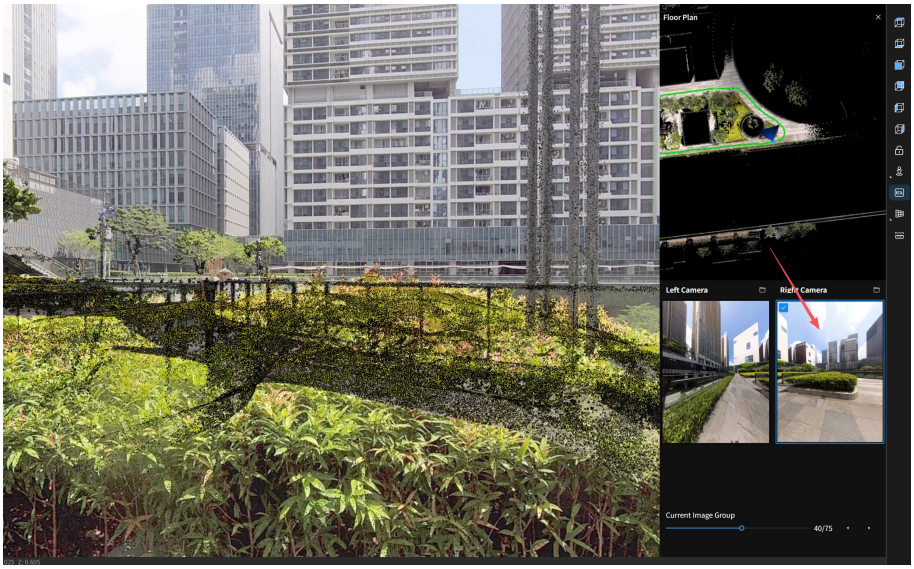


Fig 9-128 Photo and Scene Linkage

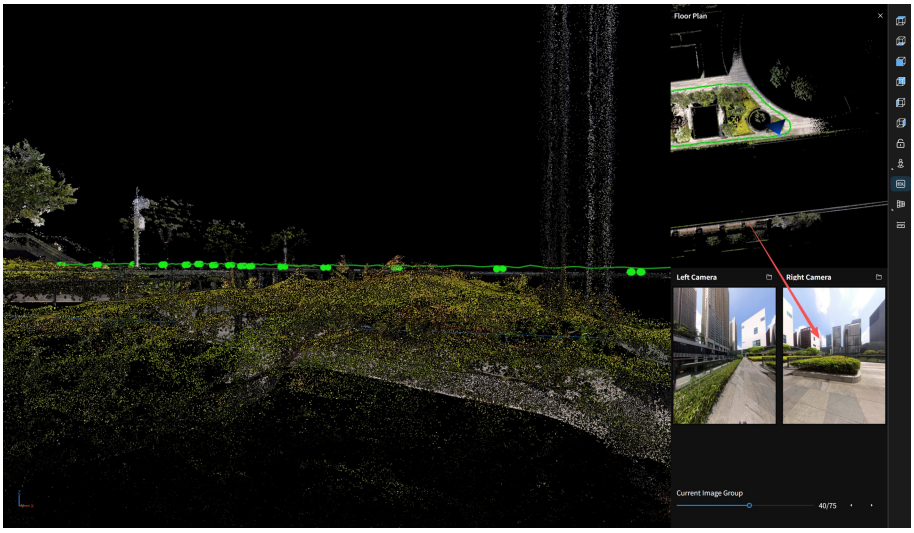


Fig 9-129 Photo and Scene Linkage(HidePhoto in the scene)

Photo-point information is also displayed in the 3D viewport. Click a photo point to jump to the corresponding photo perspective, while synchronizing the plan view and the photo window.

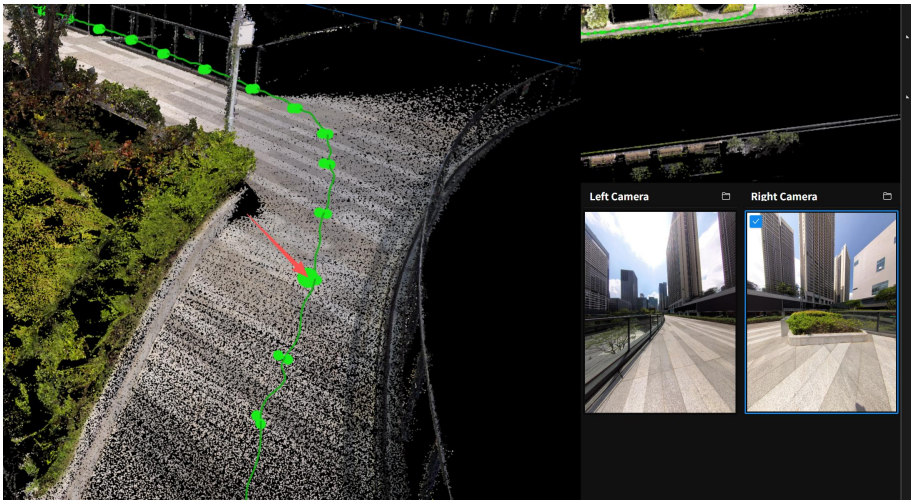


Fig 9-130 Click to Jump to the Photo Viewpoint

The **Attribute Query** or **Measurement Tools** can also be used simultaneously for measurement in the 3D scene.

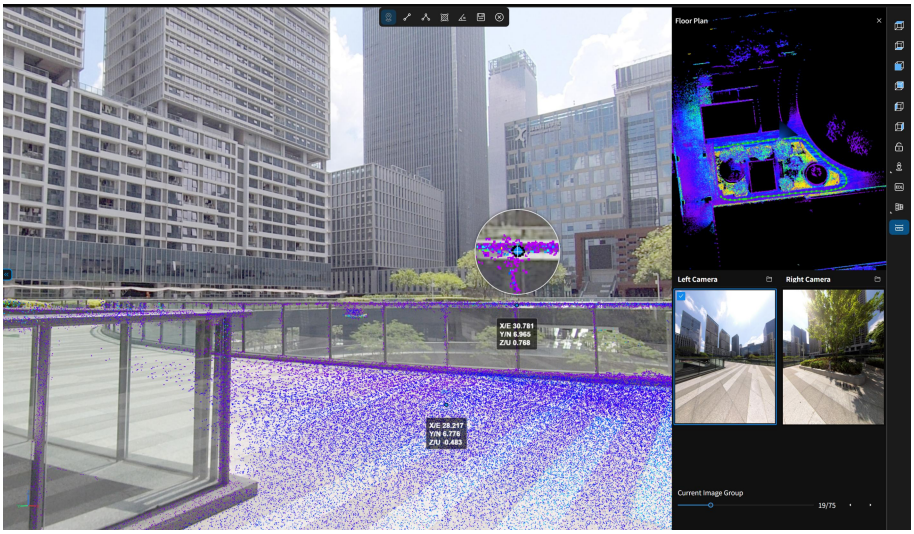


Fig 9-131 Measurement in Image Comparison

9.13. Point Cloud Registration

9.13.1. Overview

Point Cloud Registration aligns point clouds in different coordinate systems so that multiple point cloud datasets share the same coordinate position.

Typical applications include:

Merging data from multiple scans;

Combining data collected by different devices;

Aligning datasets whose coordinates have not yet been unified.

During registration:

The reference point cloud remains unchanged;

The registration point cloud is transformed according to the matching result.

9.13.2. Workflow

Step 1: Select Point Clouds

Click Point Cloud Registration.

Select the reference point cloud (used as the fixed reference coordinates) and the registration point cloud (the dataset to be moved into the reference position).

Click Confirm to open the registration interface.

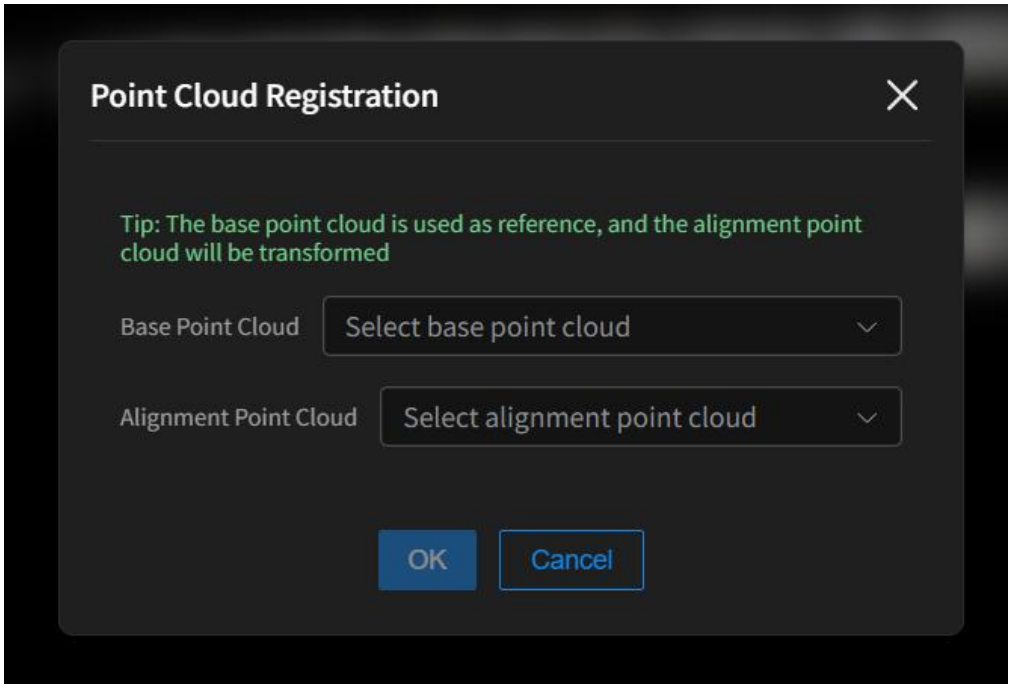


Fig 9-132 Selecting the Reference and Registration Point Clouds

Step 2: Pick Corresponding Points

After entering the point-picking interface:

The reference point cloud is displayed on the left, and the registration point cloud is displayed on the right.

Select feature points at the same physical locations in both views.

Examples include building corners, wall corners, fixed ground points, and pre-installed targets.

Choose fixed features that are clearly identifiable in both point clouds and distribute them across the overall dataset. Do not concentrate all points in one local area or place them on the same straight line.

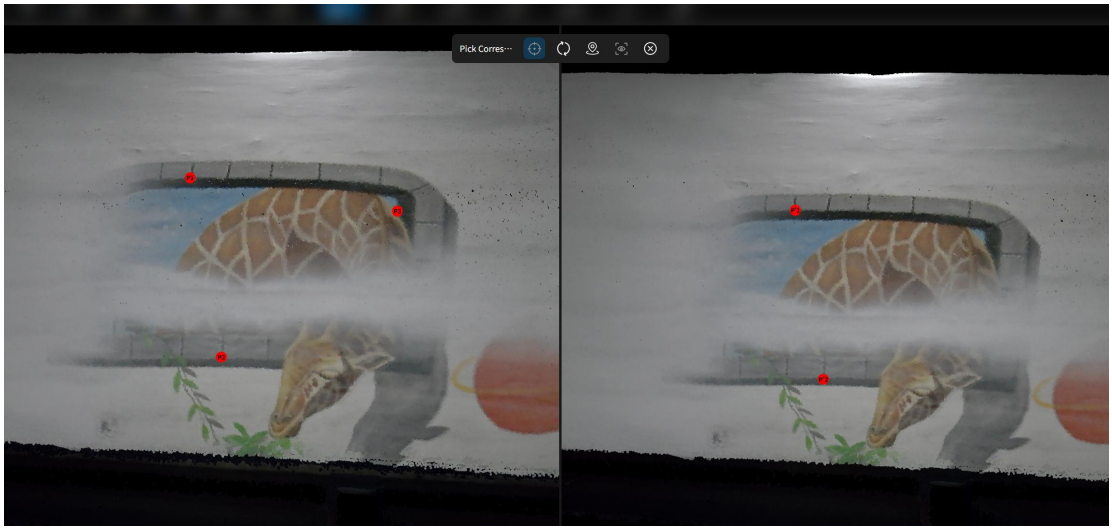


Fig 9-133 Picking Corresponding Points

Step 3: Check Match Status

After matching the points:

Indicator	Description
Red point	Unmatched point
Green point	Small registration error
Yellow point	Large registration error; check the match

The software calculates the point matching error.



Fig 9-134 Checking Match Status

Step 4: Preview the Registration

Click Registration Preview.

The software displays:

The reference point cloud;

The transformed registration point cloud;

The registration-point error report.

Check whether the two point clouds overlap correctly.

Step 5: View the Registration Report

Click Report.

The report includes:

Parameter	Description
Reference point	Reference-point name
Registration point	Corresponding-point name
Deviation	Matching error between the two points

The report content can be copied.

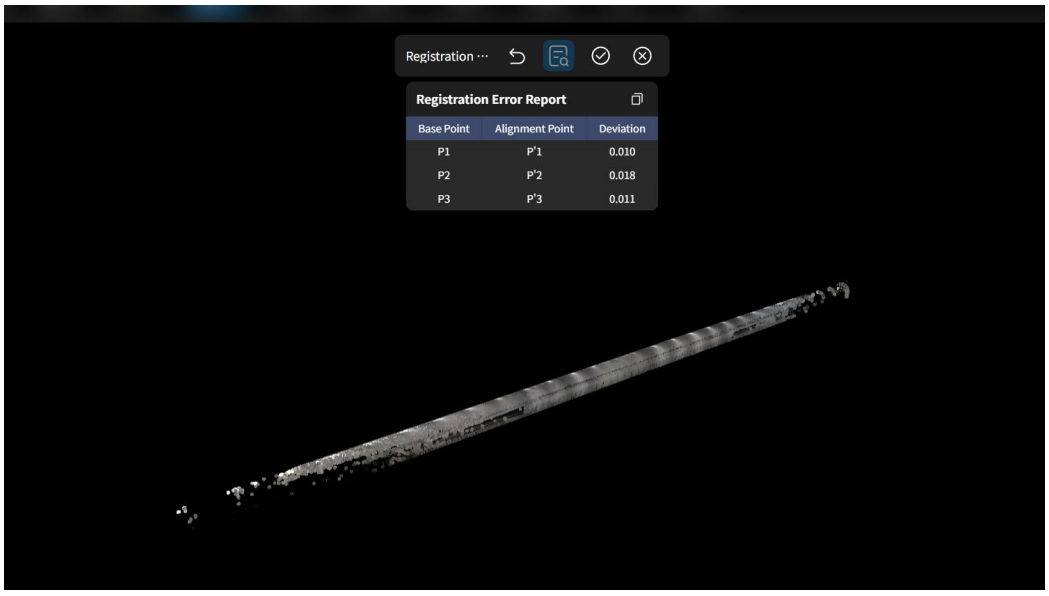


Fig 9-135 Registration Preview and Error Report

Step 6: Confirm the Registration

After confirming the result, click Confirm.

The software generates a registered point cloud named original_name_registered.las. A new result file is created; the original point cloud is not overwritten.

The new point cloud is automatically added to the project data list.

9.14. Coordinate Transformation

9.14.1. Overview

Coordinate Transformation converts point cloud data to a target coordinate system.

Typical applications include:

RTK was not enabled during acquisition and the point cloud has no absolute coordinates;

RTK or control-point quality is insufficient and the point cloud coordinates must be recalibrated;

Target coordinate information is known and the point cloud must be transformed to the specified position.

Coordinate Transformation supports:

Calculating transformation parameters from control points;

Applying confirmed transformation parameters directly.

9.14.2. Workflow

Step 1: Open Coordinate Transformation

In the Function Area, click Coordinate Conversion to open the Coordinate Transformation window.

Select the point cloud file to transform.

Multiple point cloud files can be selected and transformed together.

Before conversion, make sure all selected point clouds use the same length unit, and verify that X, Y, and Z in the control-point file represent easting, northing, and elevation respectively.

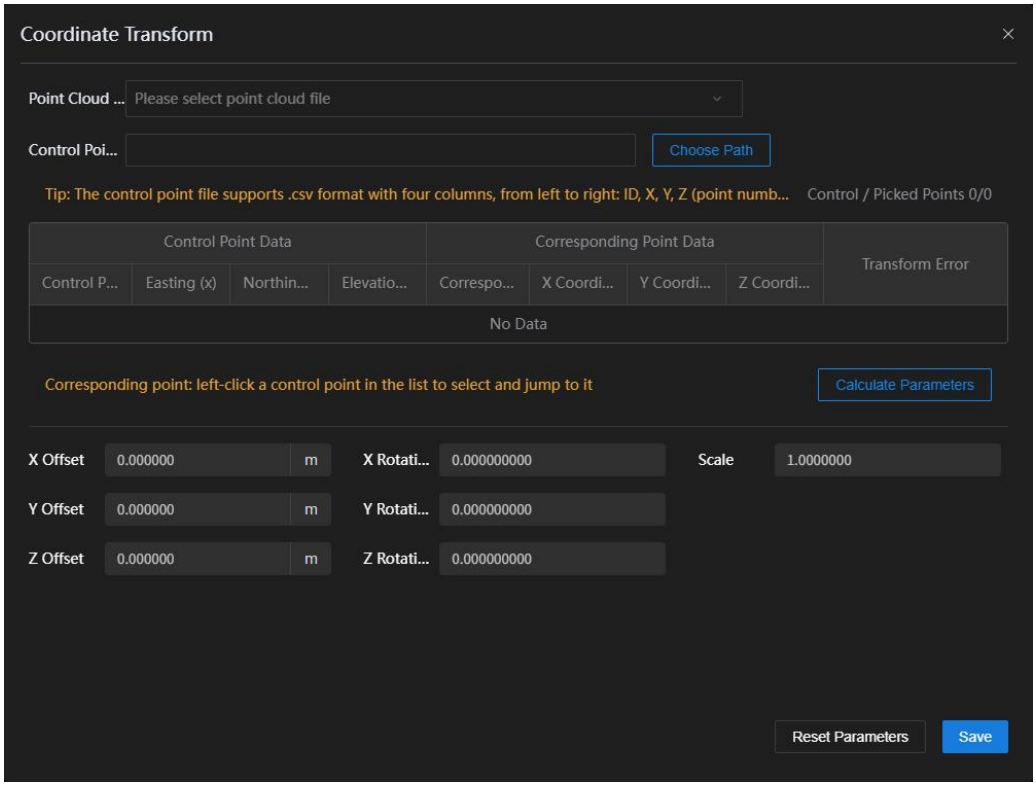


Fig 9-136 Coordinate Transformation Parameters

Step 2: Import Control Points

Click Import Control Point File and select the control-point file.

After reading the file, the software displays the control-point names, coordinates, and corresponding-point information.

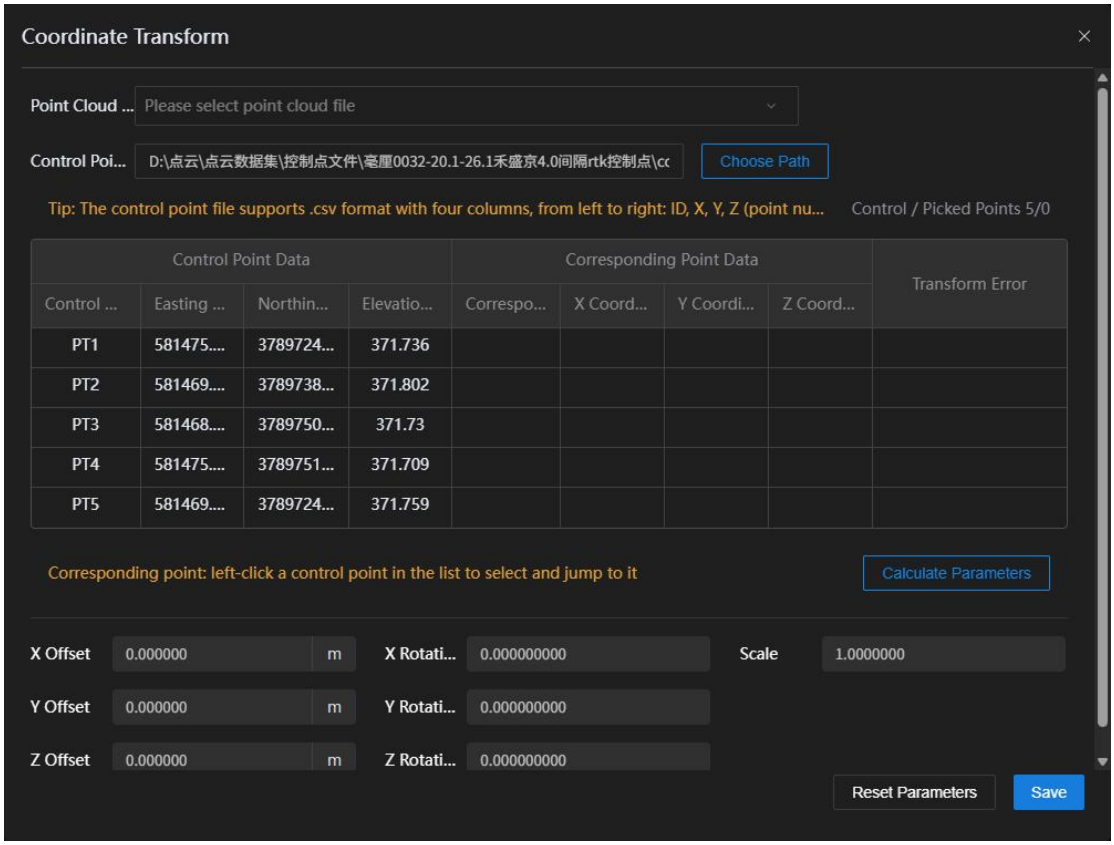


Fig 9-137 Importing Control Points

Step 3: Match Corresponding Points

Select the control point to match from the control-point list.

Click the "Zoom To" button in the control-point list to move the 3D view to the selected control point.

Click the corresponding location in the point cloud to complete the match.

Match status:

Status	Meaning
Red point	Not matched
Yellow point	Currently selected point
Green point	Matched

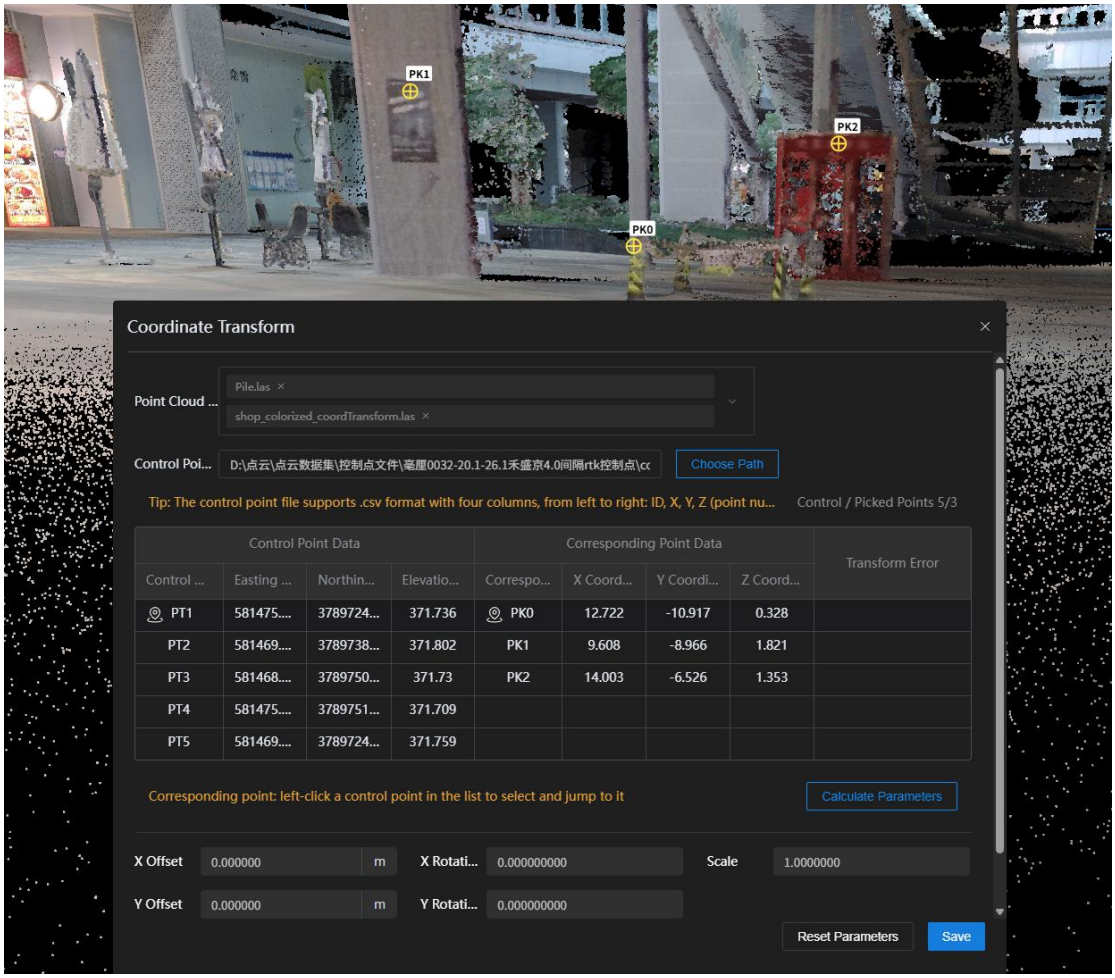


Fig 9-138 Matching Corresponding Points

Step 4: Calculate Transformation Parameters

After matching at least three valid control points, click:

Calculate Transformation Parameters.

The software calculates and displays the transformation parameters and point transformation errors.

If a control point has a large error, delete it and recalculate. After calculation, "Transform Preview" updates in real time.

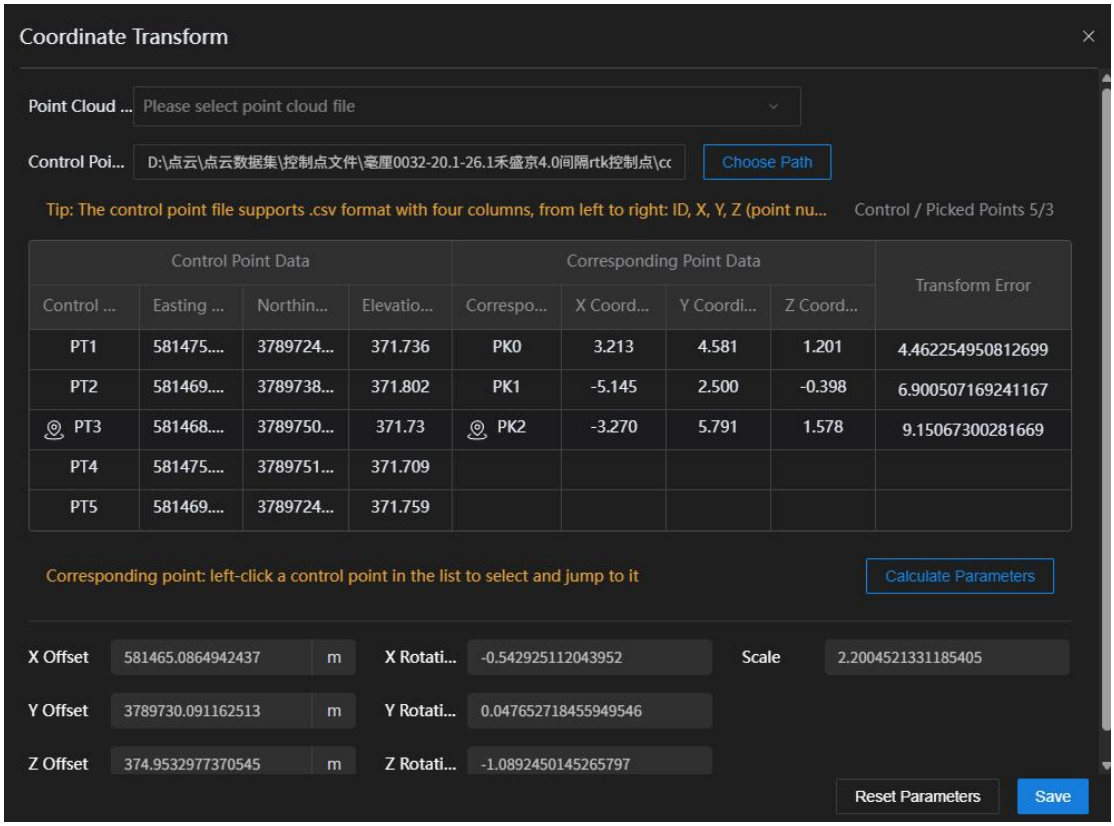


Fig 9-139 Calculating Transformation Parameters

Step 5: Save the Result

After confirming the transformation result, click Save. The software creates original_filename_converted.las in the specified path; the original point cloud is not overwritten.

9.15. Mesh Generation

9.15.1. Overview

Mesh Generation converts a point cloud into a viewable, measurable and editable 3D mesh model.

9.15.2. Workflow

1. In the "Data Management" panel, check a single point cloud.
2. Click the "Mesh Generation" button in the main ribbon; the parameter dialog opens.

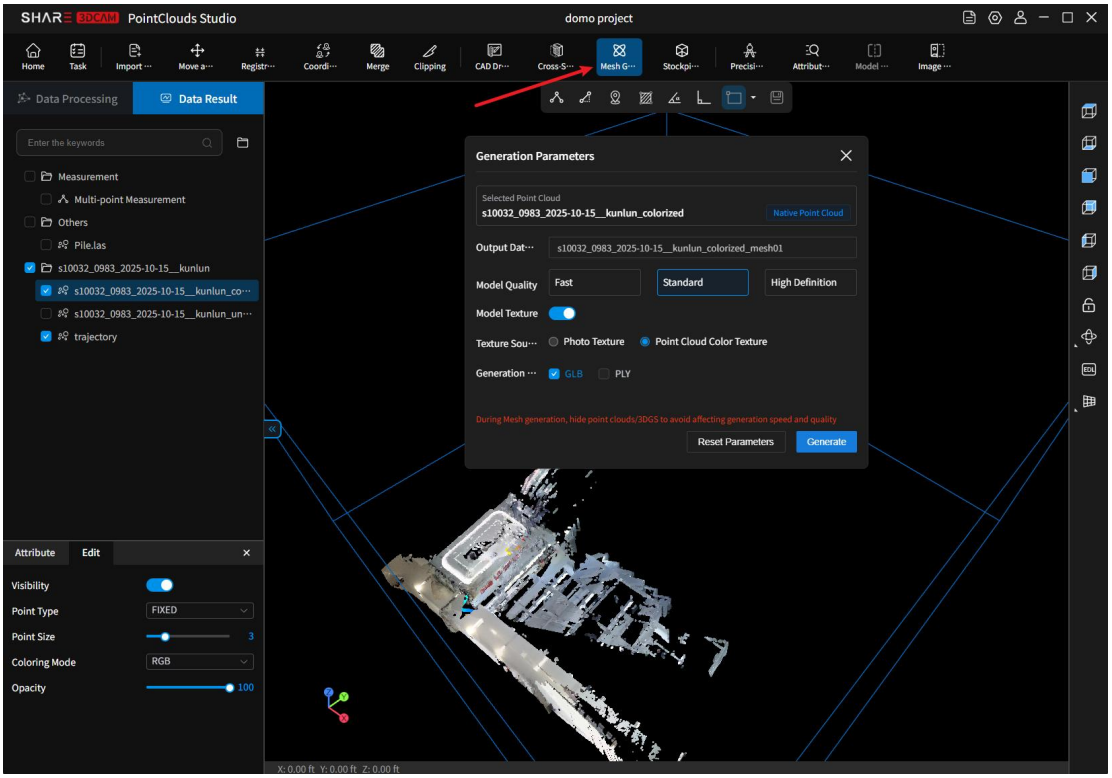


Fig 9-140 Mesh generation parameter dialog

3. Set "Output Data Name", "Model Quality" (Fast / Standard / High Definition), "Texture Source" and "Generation Format" (GLB checked by default; PLY optional).

Note: "Texture Source" has two options: "Photo Texture" and "Point Cloud Color Texture". Photo Texture generates the model surface texture from the captured photos and looks more realistic; it can only be selected when "Mapping Optimization" was turned on during solving, and data solved with RTK enabled does not support it for now. Point Cloud Color Texture generates the texture from the point cloud's own colors.

4. Click "Generate" to create the task. If another reconstruction task is running, the new task is queued automatically; you can view progress, reorder or cancel it in "Task" (see the Task Management section).

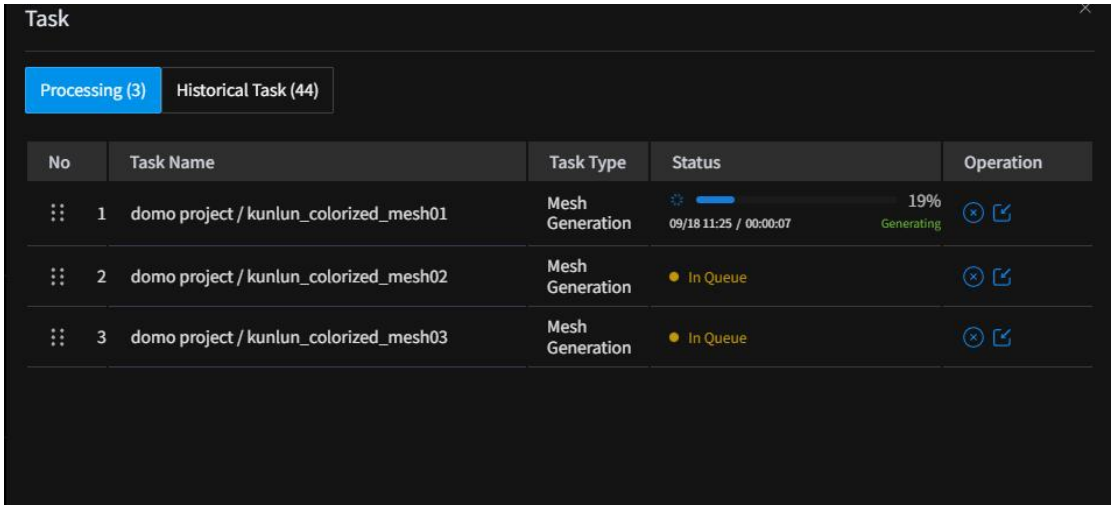


Fig 9-141 Task queuing

Note: Clicking "Generate" opens a prompt because Mesh generation uses substantial GPU resources. It recommends hiding displayed point clouds and 3DGS models; click "OK" to continue.

9.15.3. Viewing the Mesh Model

1. After generation succeeds, the result is added under the source point cloud node in the "Data Management" panel; it is hidden by default — check it to display it in the 3D scene.

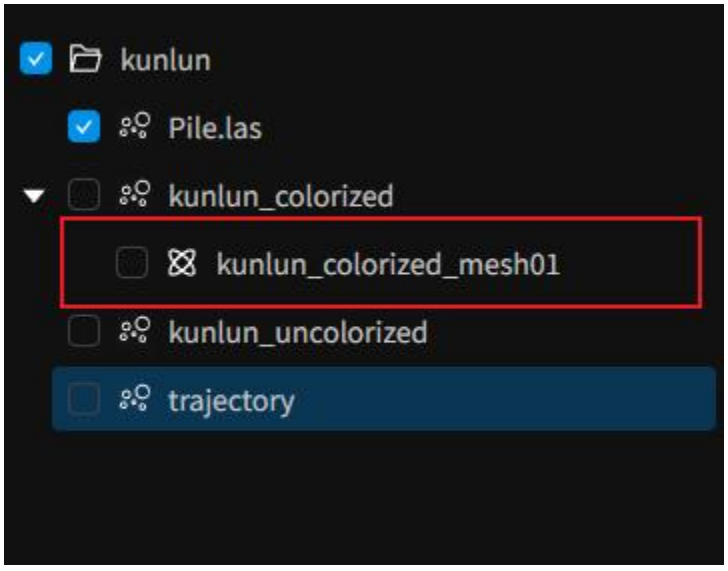


Fig 9-142 Mesh node in the data results tree

2. In the "Properties" panel you can switch the display mode (Model Texture / Solid Color), adjust opacity and toggle wireframe.

3. You can reuse "Move and Rotate" and the measurement tools to edit and measure the mesh model.

4. Right-click the result node to locate, rename, open its folder, view properties or remove it.

9.16. Stockpile Measurement

9.16.1. Overview

Stockpile Measurement calculates the volume, footprint area and weight of stockpiles (such as earthwork, ore piles and grain bins). After drawing the calculation boundary, the software computes the volume difference between the actual surface and a reference plane, and outputs stockpile volume, void volume, net volume difference, weight, etc.

9.16.2. Workflow

1. Click "Volume Measurement" in the main ribbon to open the "Stockpile Measurement" panel.

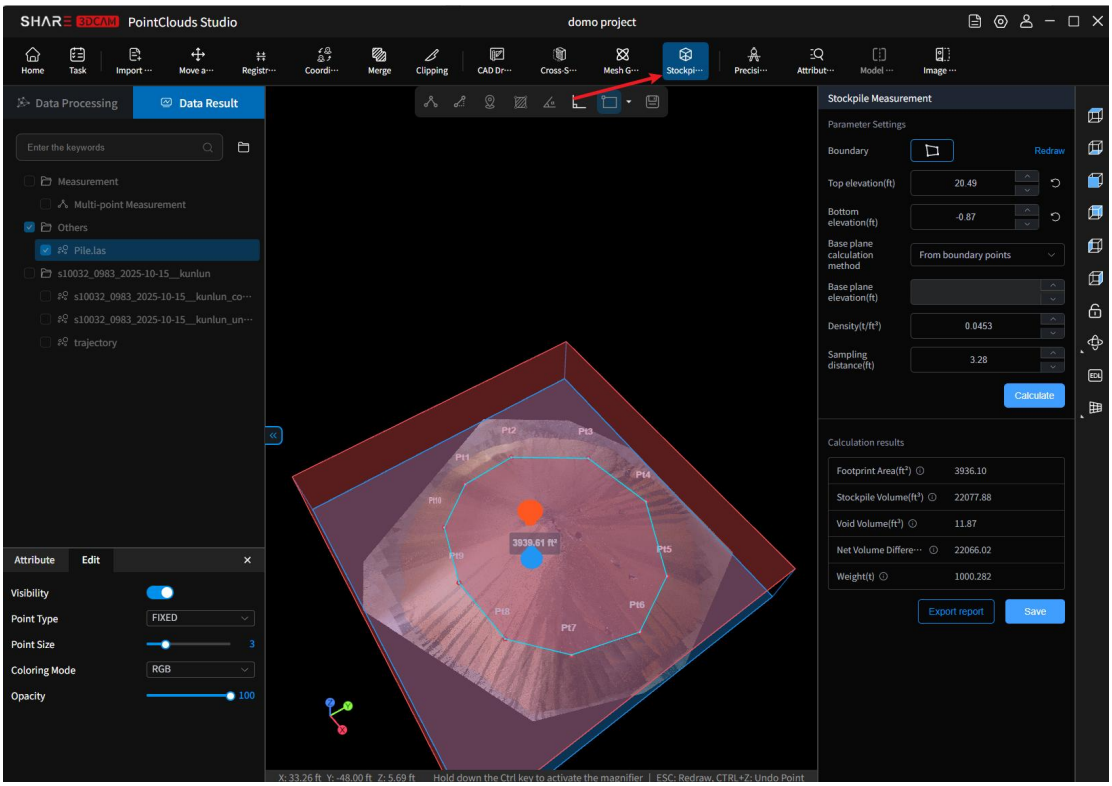


Fig 9-143 Activating stockpile measurement

2. Left-click in the 3D scene to add boundary vertices one by one (press Ctrl+Z to undo the last point); right-click to finish drawing. Click "Redraw" to clear the boundary and redraw.

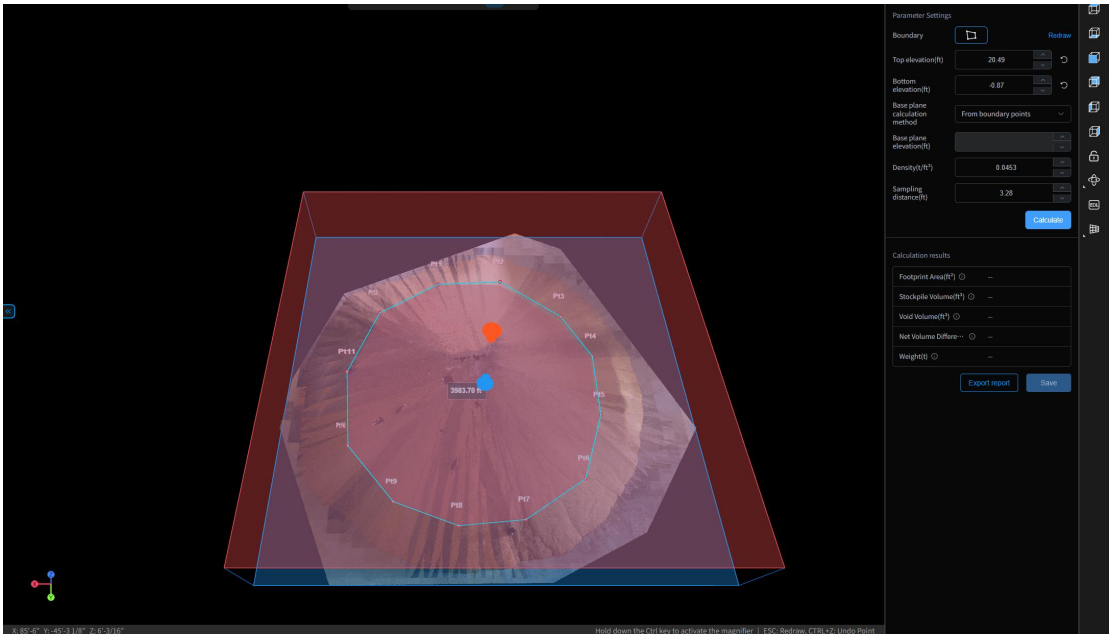


Fig 9-144 Drawing the calculation boundary

3. Adjust "Top elevation" and "Bottom elevation" to define the point cloud range used in the calculation. You can drag the elevation planes in the scene to adjust their positions, or click "Reset" to restore the defaults.

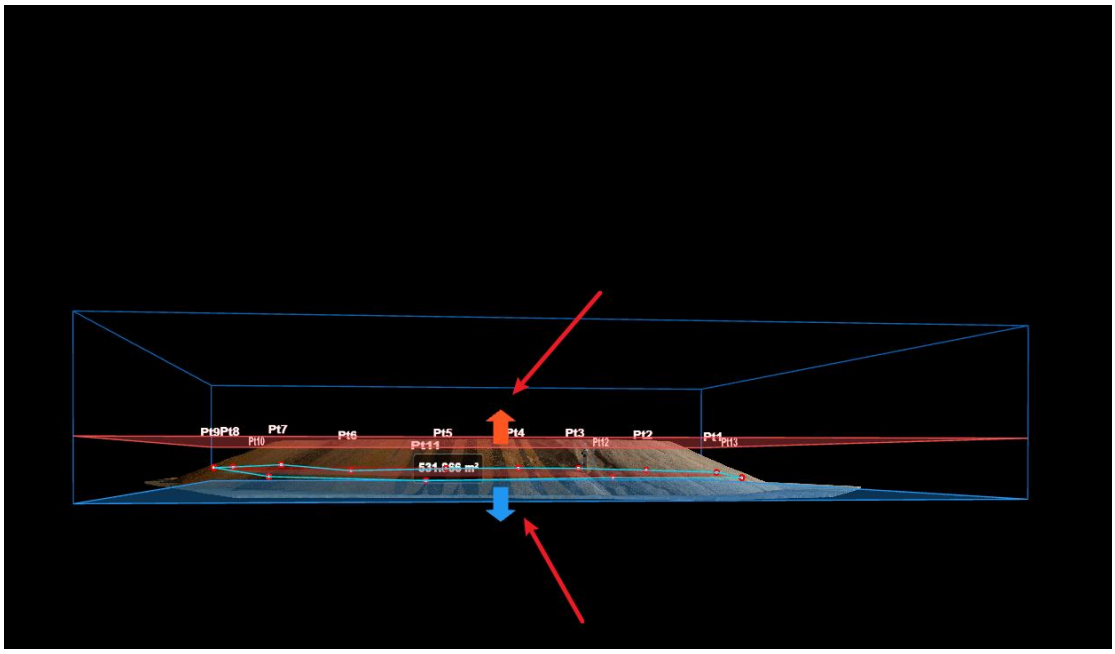


Fig 9-145 Adjusting top/bottom elevation

4. Choose the "Base plane calculation method" to define the reference plane:

- From boundary points: the reference plane is fitted from the bottom points near the boundary; suitable for stockpiles on sloping ground.
- Horizontal plane at average elevation: a horizontal reference plane at the mean point cloud elevation; suitable for relatively flat sites.
- Horizontal plane at highest point: a horizontal reference plane at the highest elevation; suitable for cut volume estimation.

- Horizontal plane at lowest point: a horizontal reference plane at the lowest elevation; suitable for fill volume estimation.
- Custom horizontal plane: enter the reference elevation manually (defaults to the mean elevation); suitable for comparing against a design elevation.

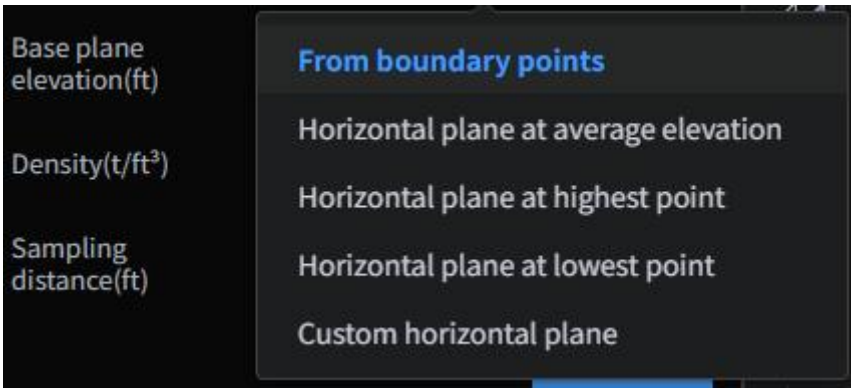


Fig 9-146 Base plane calculation methods

5. Enter the material density (t/m³) and sampling distance (m; default 1 m — smaller values give finer results but take longer).

6. Click "Calculate"; the results show footprint area, stockpile volume, void volume, net volume difference and weight.

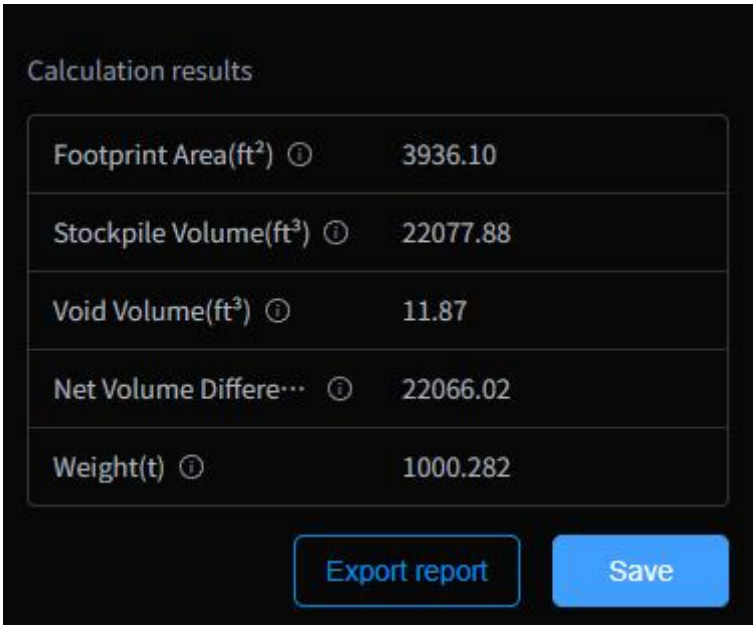


Fig 9-147 Calculation results

7. Click "Save" to save the measurement: enter a name (required) and material (optional). Saved results can be located, selected, renamed, deleted and viewed in the "Data Management" panel. You can take multiple measurements in succession.

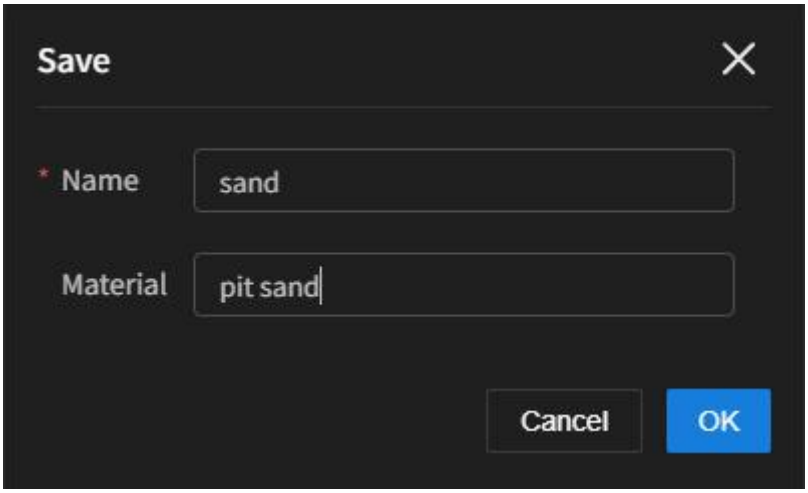


Fig 9-148 Saving the measurement result

8. To generate a report, click "Export report" to export a report from the template.

Note: calculation cannot proceed (a prompt appears at the top of the viewport) if no boundary is drawn, if the top elevation is not greater than the bottom elevation, or if the boundary contains no valid points.

9.17. Semantic Point Cloud

9.17.1. Overview

A semantic point cloud is a point cloud carrying semantic recognition information. When "Semantic recognition" is enabled during solving and recognition labels are selected, the software recognizes object categories in the point cloud (such as walls, floors, doors and windows). After solving, switch to "Semantic mode" under "Edit" – "Rendering Mode": different categories are displayed in different colors, and right-clicking a point shows its specific category — a quick way to understand "what is where" in the scene.

9.17.2. Workflow

1. In the "Data Processing" panel, select the task and turn on the "Semantic recognition" switch in the "Point Cloud Mapping" (on by default); the scene selection and semantic label selection areas appear below.

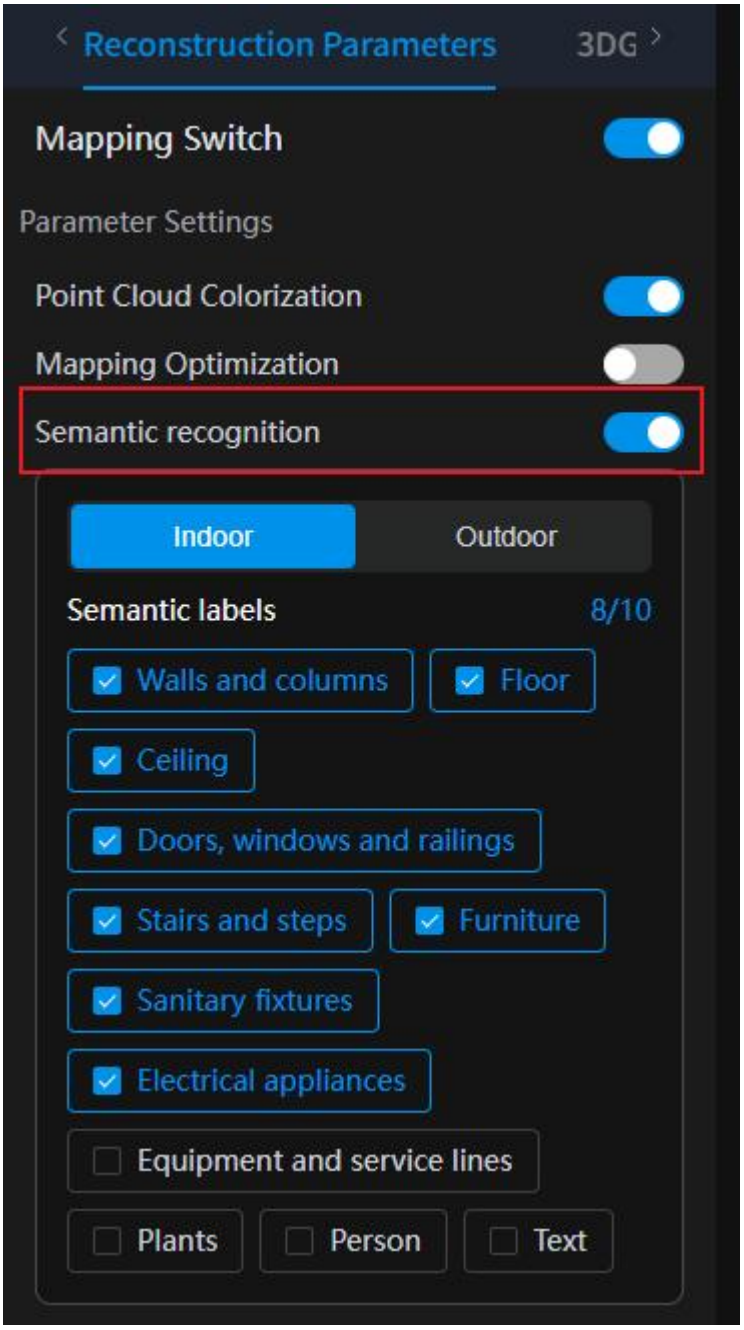


Fig 9-149 Turning on the Semantic recognition switch

2. Select the recognition scene: "Indoor" or "Outdoor"; the semantic label list switches with the scene.

3. Check the semantic labels to recognize: the first 8 labels are checked by default; you can uncheck them or check other labels, up to 10 labels. To recognize objects beyond the preset labels, add custom labels in the input box (they count toward the 10-label limit and can be deleted).

4. Click "Start Processing".

5. After solving completes, open the point cloud result and select "Semantic mode" under "Edit" – "Rendering Mode"; different categories of points are displayed in different colors.

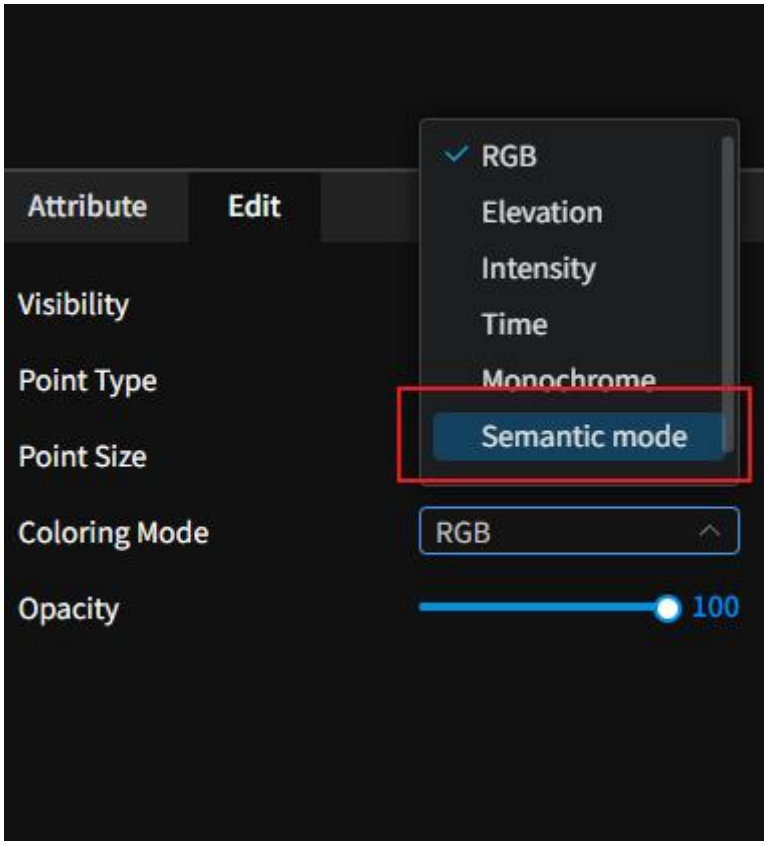


Fig 9-150 Switching to Semantic mode

6. Right-click a point in the model space; a semantic card appears next to the cursor showing "Primary category" and "Secondary semantics" for that point (e.g., "Building and Structures / Wall"). Click empty space or press Esc to close the card.

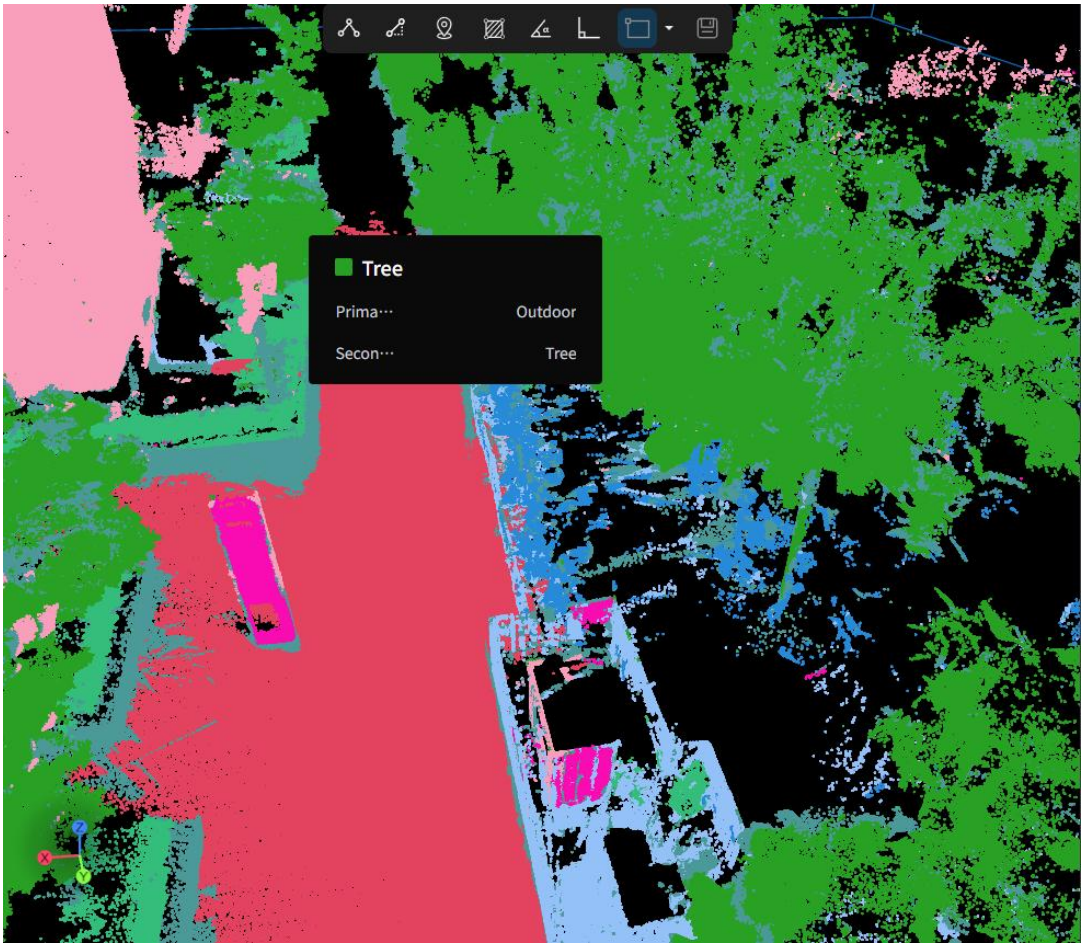


Fig 9-151 Querying semantics with right-click

Note: point cloud results solved without "Semantic recognition" enabled, or imported point clouds, contain no semantic data — "Semantic mode" is not shown in "Rendering Mode". The scene and label selections are saved per solving task and restored automatically when the same task is re-solved.

Chapter 10. System Settings

System Settings is used to configure the language and default workspace, and it also allows you to check whether a new software version is available.



Fig 10-1 System Settings

10.1. Language Switching

Click the Language drop-down list to switch the system language. V2.6 supports the following 11 interface languages: Simplified Chinese, English, German, Japanese, Italian, French, Korean, Spanish, Russian, Polish, and Portuguese (Brazil).



Fig 10-2 Language Switching

10.2. Change Default Workspace

When a new project is created, project data is stored in the system workspace by default. This path is located on drive C:, but the user can change it.

Click **Change** to modify the location of the default workspace.

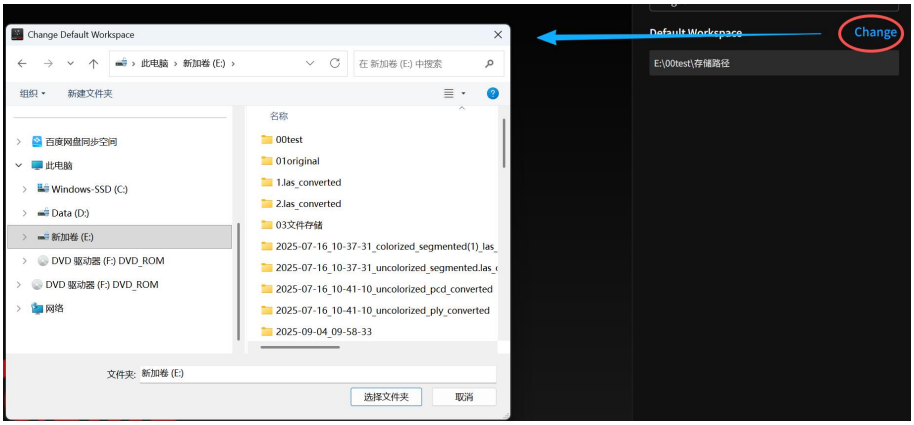


Fig 10-3 Changing the Default Workspace

10.3. Check Updates

Click **Check Updates** to determine whether the current version is the latest. If a newer version exists, the software can be updated.

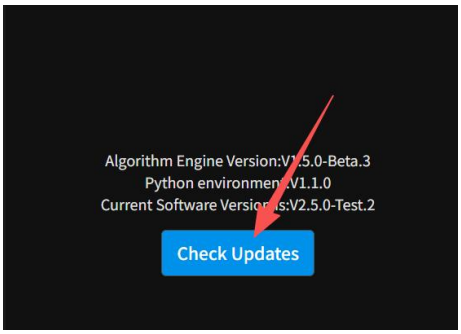


Fig 10-4 Check for Updates



Fig 10-5 Software Update Prompt

Click **Update Now** to enter the software update workflow. For details, see **Upgrade and Update**.

10.4. Unit Conversion

Click the "Measurement unit" drop-down list to switch the display units of the software: meters (m), centimeters (cm), millimeters (mm), inches (in) and feet (ft); meters (m) is the default. The change takes effect immediately and is retained after restarting the software. When foot (ft) is selected, you can further choose "Decimal feet" or "Duodecimal feet (US customary)" as the display format.

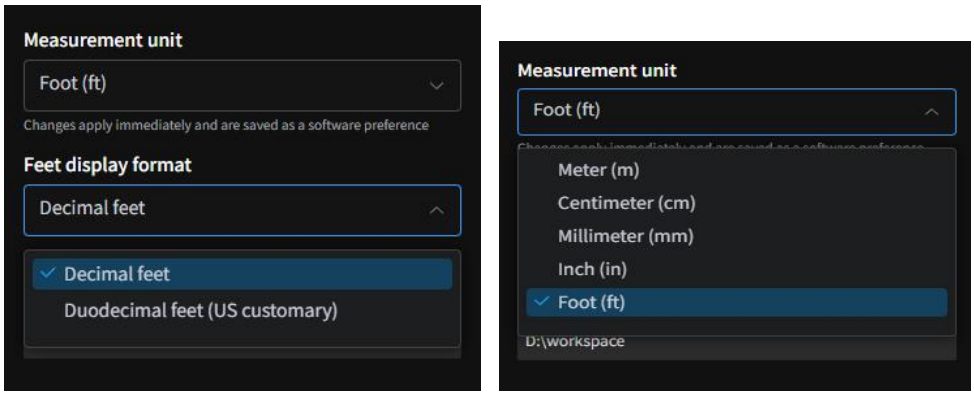


Fig 10-6 Measurement Unit Settings

Note: after switching units, measurement values and coordinates are converted to the new unit for display and input; CAD drawing dimensions newly generated use the current unit setting, while previously generated CAD annotations remain unchanged.

Appendix

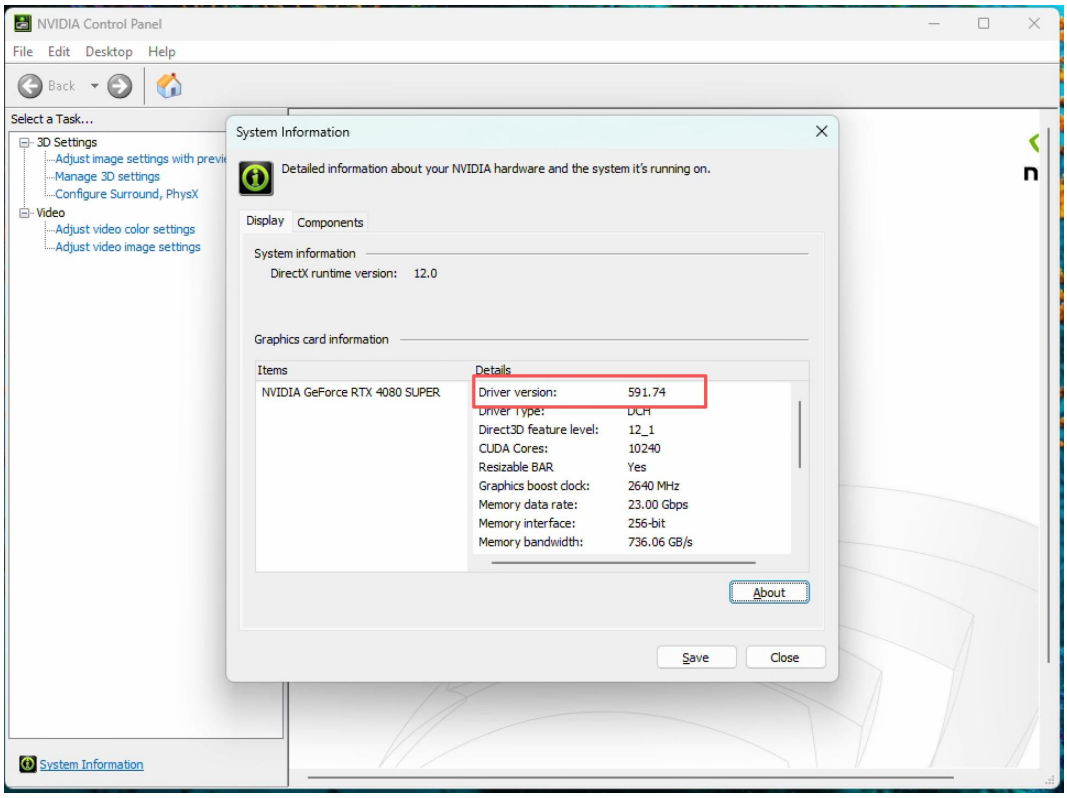
Appendix 1: Using a Dedicated GPU to Accelerate Point Cloud Reconstruction

If your computer is equipped with a high-performance NVIDIA dedicated graphics card, the SHARE point cloud reconstruction algorithm can use NVIDIA CUDA (Compute Unified Device Architecture) parallel computing architecture and programming model to accelerate reconstruction during the point cloud colorization stage.

1. Check the Graphics Driver Version

This acceleration process requires your NVIDIA graphics driver version to be 572.83 or later. If your system firmware or driver version is too low, you need to upgrade the NVIDIA graphics driver. You can check the current driver version in the following way.

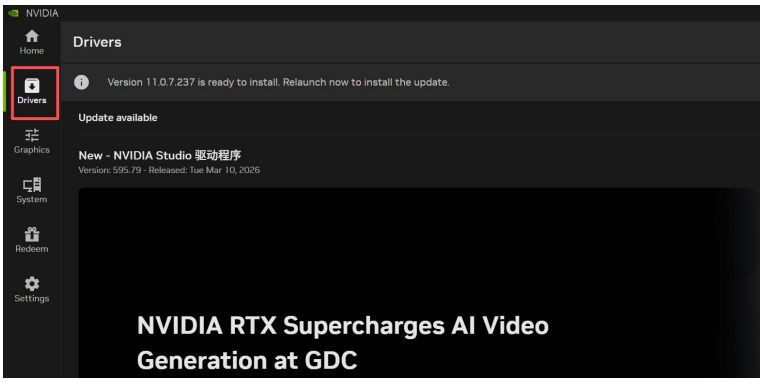
Search for NVIDIA Control Panel on your computer and open it. Click System Information at the bottom to view the current NVIDIA graphics driver version.



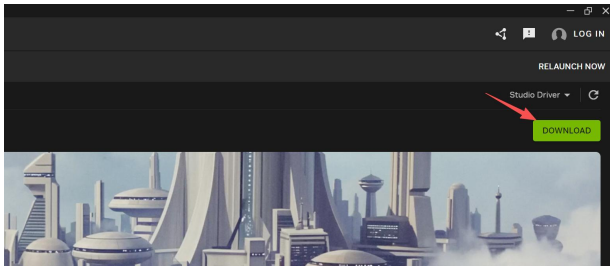
2. Upgrade the Graphics Driver

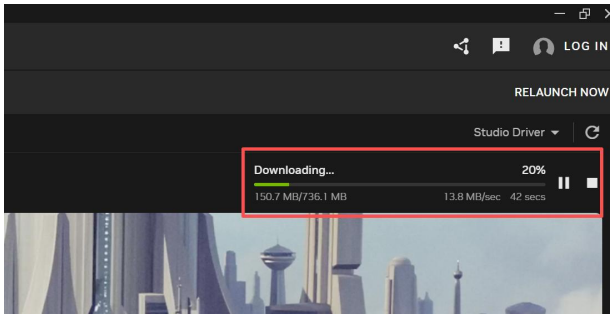
If your NVIDIA graphics driver version is too low, you can follow the process below to update it.

Open the NVIDIA App, then click Drivers to switch to the driver management page.

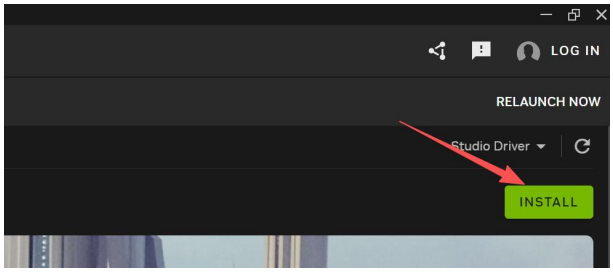


On the driver management page, click Download in the upper-right corner to download the latest driver.





After the download is complete, click Install to install the latest graphics driver.







Appendix 2: Common Problems and Troubleshooting

Before troubleshooting, preserve the raw data, project directory, result data, and logs. Do not delete, move, or overwrite these files directly.

Issue	Possible Cause	Recommended Action
Raw data cannot be added	The raw-data directory is incomplete, copying was interrupted, or the wrong subfolder was selected.	Copy the complete raw-data directory again. Do not change the directory structure or file names. Confirm that both the storage medium and target disk can be read and written normally.
Point cloud reconstruction fails	Insufficient disk space, VRAM, or memory; incompatible graphics driver; or abnormal raw data.	Save the current project, verify available disk space, and close applications using the GPU. Retry with an officially supported graphics driver. If the problem persists, upload

		the log for the affected task.
3DGS cannot start or the result quality is abnormal	Undistorted photos were not output, photo data is incomplete, acquisition quality is insufficient, or VRAM is insufficient.	Confirm that undistorted-photo output was enabled and check the photo directory. Adjust Processing Preference according to the computer configuration. Use point cloud data—not 3DGS—for dimensional or accuracy judgments.
Software or algorithm-engine update fails	Network interruption, insufficient permissions, an incomplete installation file, or a processing task is still running.	Save the project and stop related tasks first. Resume the download or retry. If necessary, obtain the complete installation package again through an official SHARE channel.
The point cloud is globally offset after registration or coordinate transformation	The source/target coordinate system, length unit, axis order, or control-point correspondence is inconsistent, or the control-point distribution is poor.	Stop subsequent export. Recheck the coordinate systems, X/Y/Z definitions, control-point correspondence, and errors. Remove abnormal points, recalculate, and preview the result first.
CAD or vector results are incomplete	The section position or thickness is unsuitable, the site contains substantial occlusion, or sloped, cylindrical, or irregular structures are present.	Adjust the section position and thickness and regenerate the result. Correct it manually with Edit and Draw, and verify critical dimensions.
Result export or third-party import fails	The target software version or file format is incompatible, the save path is invalid, or disk space is insufficient.	Confirm the export format and target software version. Prefer a short local path and check disk space. Preserve the source file and export again.
Technical support is required	The issue remains unresolved after routine troubleshooting.	Upload the relevant log from History Tasks and provide an accurate contact name, contact details, and issue description. Do not delete the raw data or logs before technical support confirms that they are no longer needed.