

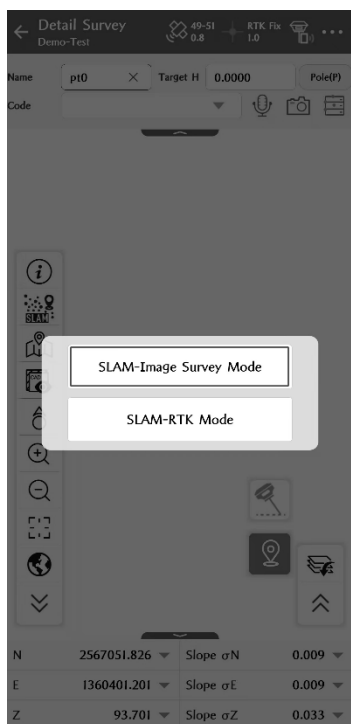


Figure 4-2-10



Figure 4-2-11

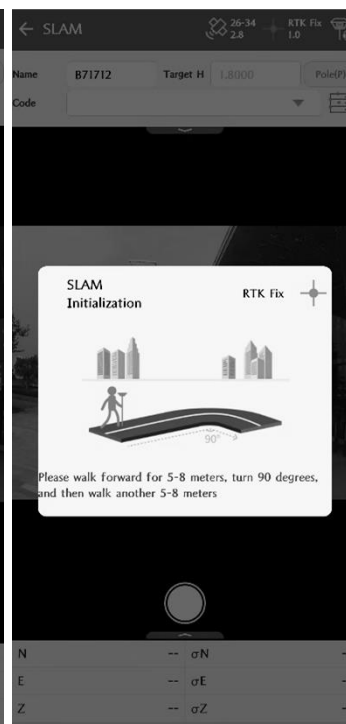


Figure 4-2-12



Figure 4-2-13

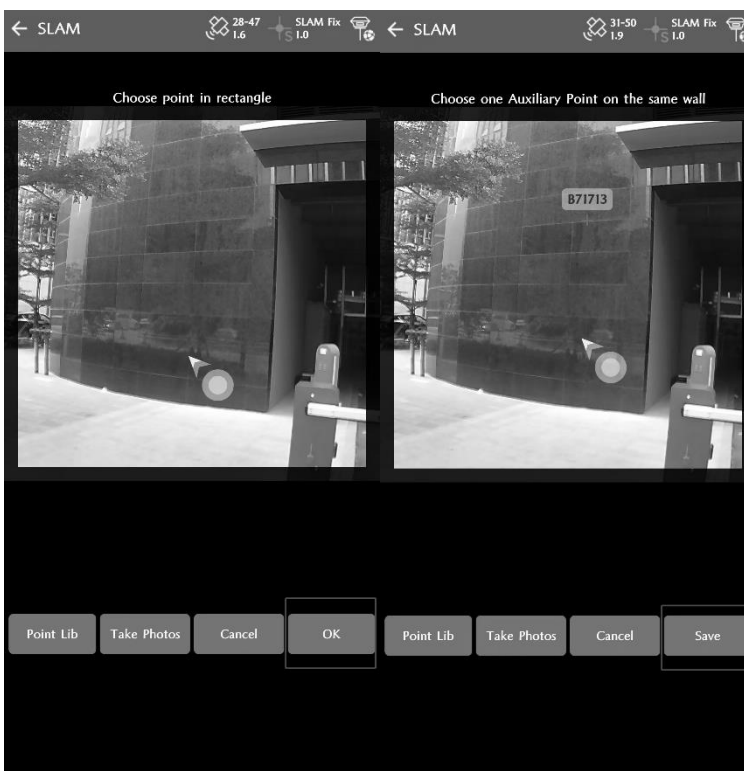


Figure 4-2-14



Figure 4-2-15

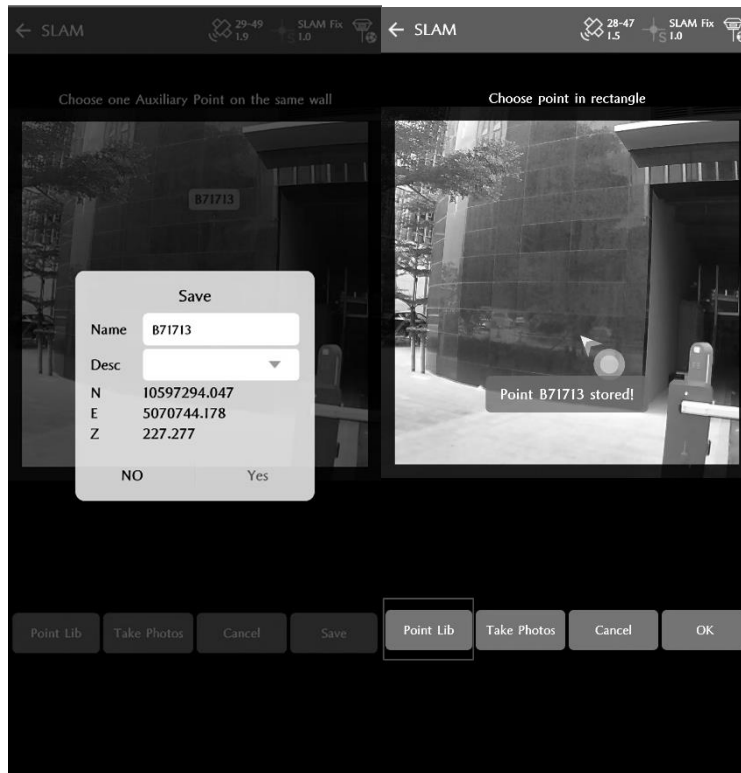


Figure 4-2-16

Figure 4-2-17



Notice:

If you have entered SLAM-RTK mode, you can directly enter SLAM image measurement mode without initialization again.

1. SLAM image measurement precautions:

- The location of the puncture point should not be at the edge of the image, because the image is distorted, and the distortion in the edge part is larger, which will affect the accuracy.
- In the 5-10s near the moment of taking a photo, there should be no dynamic objects, such as pedestrians and vehicles, between the camera and the real location of the puncture point. Otherwise, there will be a point cloud of dynamic objects in the map construction, resulting in the puncture point hitting dynamic objects. (Avoid multiple values in the direction of depth search).
- Please do not choose objects with low reflectivity, transparency or light absorption where the puncture point is located. Common objects such as glass, liquid, smooth water surface, mirror and asphalt ground.
- If the puncture point is far away, it is best to stay for about 5s first, so that the LiDar can fully scan the object of the required puncture point before taking a photo of the puncture point. Otherwise, the puncture point object is too sparse, which will affect the puncture point accuracy.

- Auxiliary points should be selected on the side that is more continuous in depth.
- Sufficient initialization can improve the accuracy of image measurement.

4.3 SLAM

After connecting to a host supporting SLAM function by WiFi, you can enter the function interface to create 3d point cloud data of tasks scanning nearby objects, and display or operate the point cloud data.

4.3.1 Task management

After entering the SLAM function, a list of point cloud data tasks will be displayed. Click "Start", input the task information and click "OK". The task is created successfully, and then jump to the scanning point cloud interface. Click the shooting button to start scanning the point cloud data of ground objects.



Figure 4-3-1



Figure 4-3-2



Figure 4-3-3

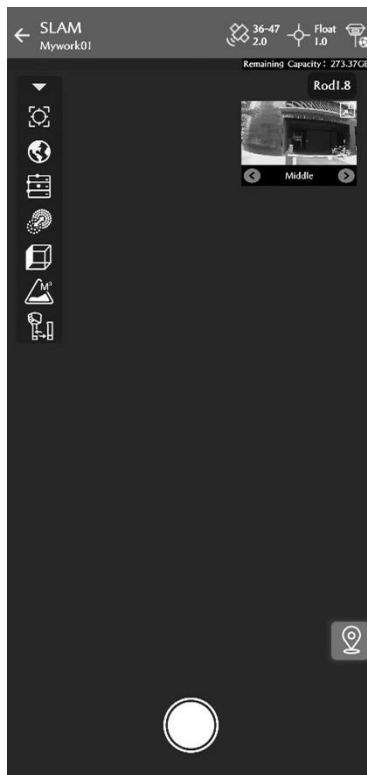


Figure 4-3-4



Figure 4-3-5

The small window in the upper right corner displays the front camera of the host by default. Click the bottom switch button to switch the three camera images on the left, middle and right of the host. When clicking the small window image, the camera image can be exchanged with the point cloud data display image. There is also a shrink button in the upper right corner of the small window, which can hide or unfold the small window.



Figure 4-3-6

[Height configuration] The height configuration entrance is above the small window, or you can click the collection button to configure.



Figure 4-3-7

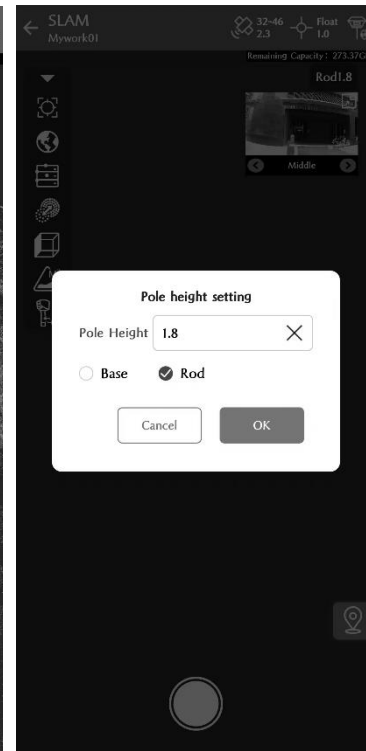


Figure 4-3-8

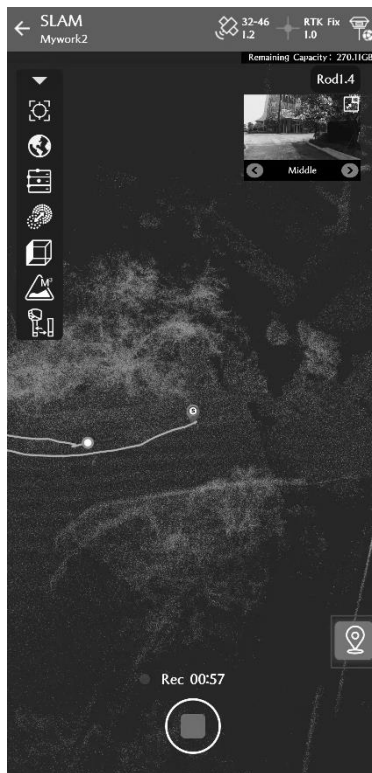


Figure 4-3-9



Figure 4-3-10

The left toolbar contains the following functions:

[Center/free] When switching to center, swipe the screen with your finger to rotate the point cloud data with the current position as the fixed point; when switching to free, swipe the screen with two fingers to move the point cloud data as a whole, and swipe the screen with one finger to rotate the point cloud data.

[Panoramic] Zoom the point cloud data to display all of it on the screen, centered on the current position.

[Point library] Click to jump to the SLAM point library of the point data.

[Color] Click the color button to select different point cloud display modes, including color, elevation, and intensity.

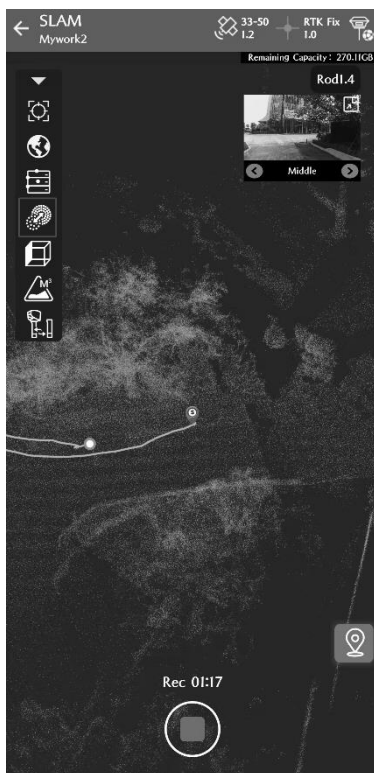


Figure 4-3-11

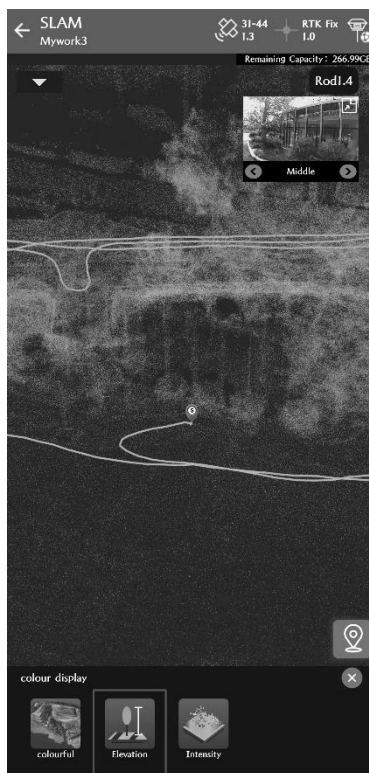


Figure 4-3-12

[View] Click the view button to select different view directions to display point cloud data, including front view, top view and left view. (Note: The view takes the laser scanning direction of the host as the positive direction)

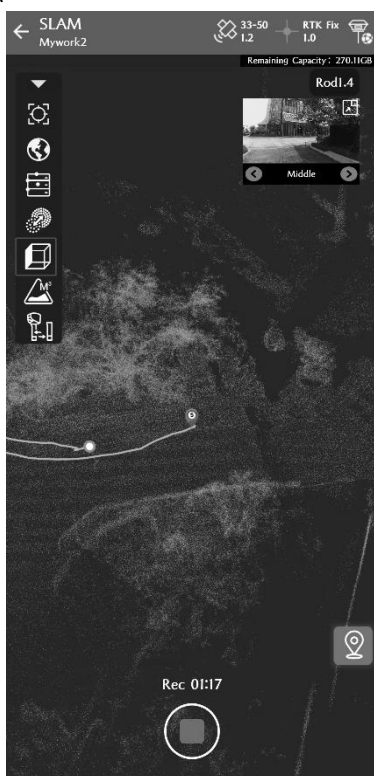


Figure 4-3-13



Figure 4-3-14

After clicking the 'Scan' button to finish the scanning, click the 'Earthwork' button. Click 'Confirm' to start the earthwork calculation. Once the relevant buttons for earthwork calculation are displayed, click the 'Select Range' button to display a movable pointer. Move the pointer to select the vertices of the earthwork range and click the 'Select Point' button to confirm the selection. After selecting the range, slide the elevation slider on the right to adjust the lowest point (which will serve as the reference elevation surface for the earthwork calculation). Then, click 'Calculation Results' to switch to the calculation result interface, where you can export the results.

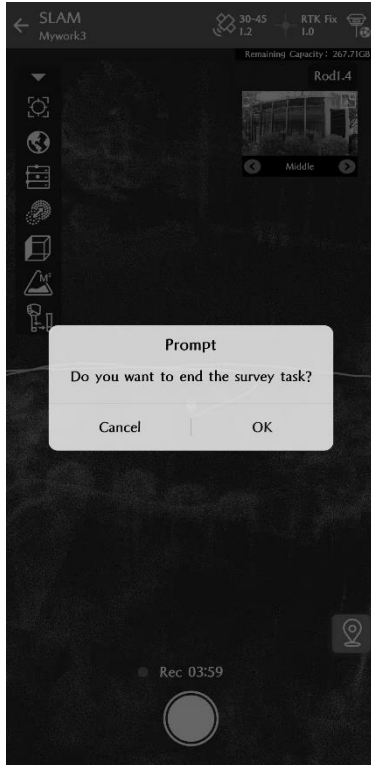


Figure 4-3-15



Figure 4-3-16

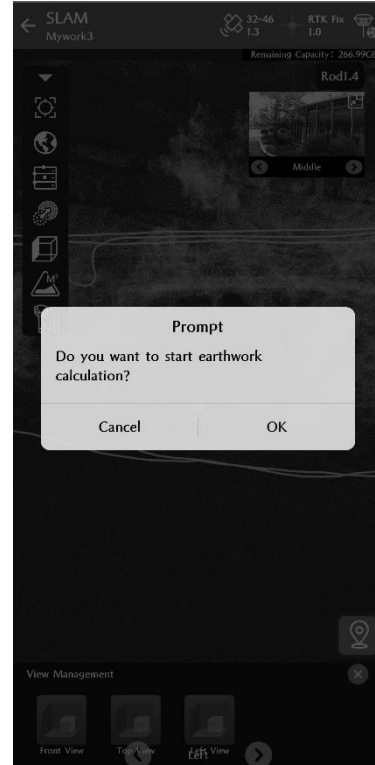


Figure 4-3-17



Figure 4-3-18



Figure 4-3-19

Results	
The result of the calculation of reference point	
Surface	SlamDTM
Ref.Elevation(m)	1351.6624
Volume	
Cut(m ³)	0.00000
Fill(m ³)	80.31590

Figure 4-3-20

[Replace battery] Click the replace battery button, click OK, and complete the battery replacement within 30s countdown.

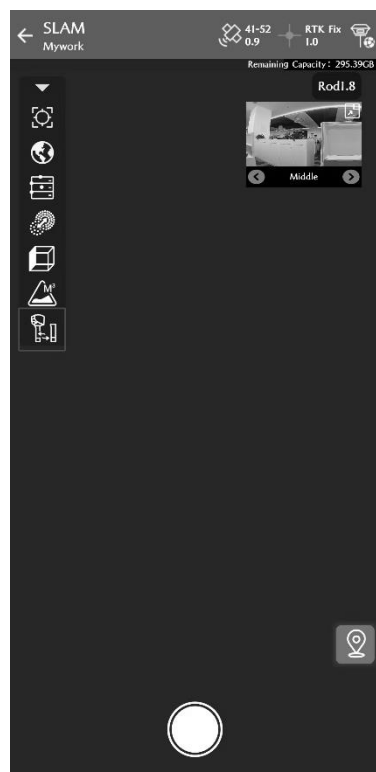


Figure 4-3-21

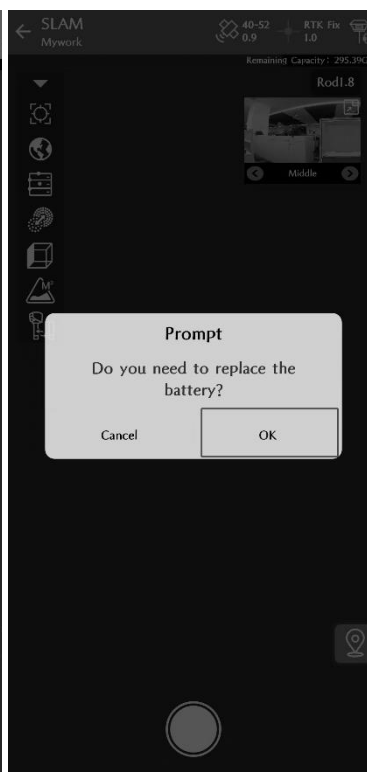


Figure 4-3-22



Figure 4-3-23

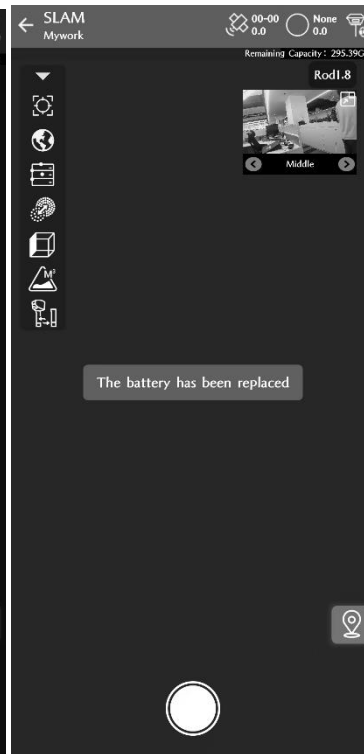


Figure 4-3-24

4.3.2 Project management

After the host creates a task in the project, it will be uploaded to the host. Click the "Management" button in the upper right corner of the task list interface to enter the host project management interface for viewing.

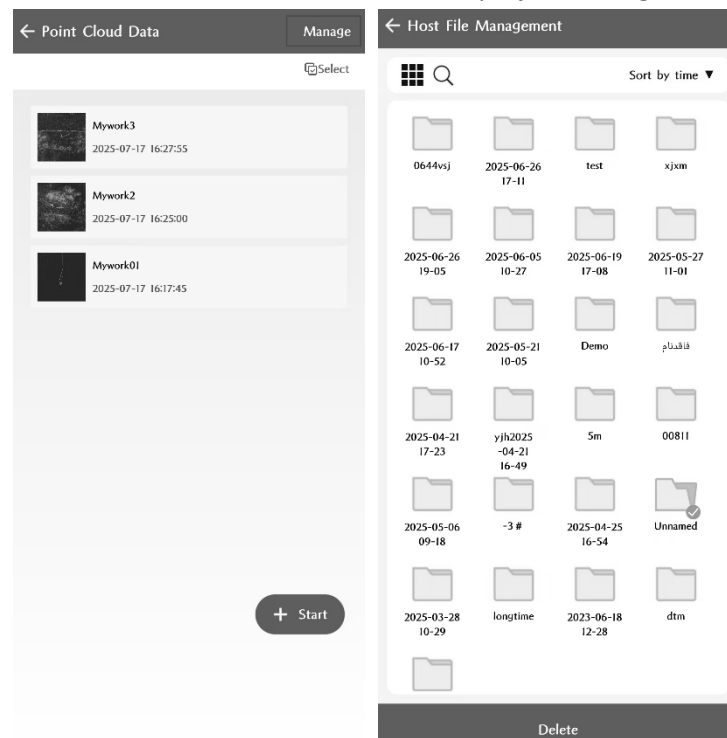


Figure 4-3-25

Figure 4-3-26

[Display mode] Click to switch the display mode of project information.

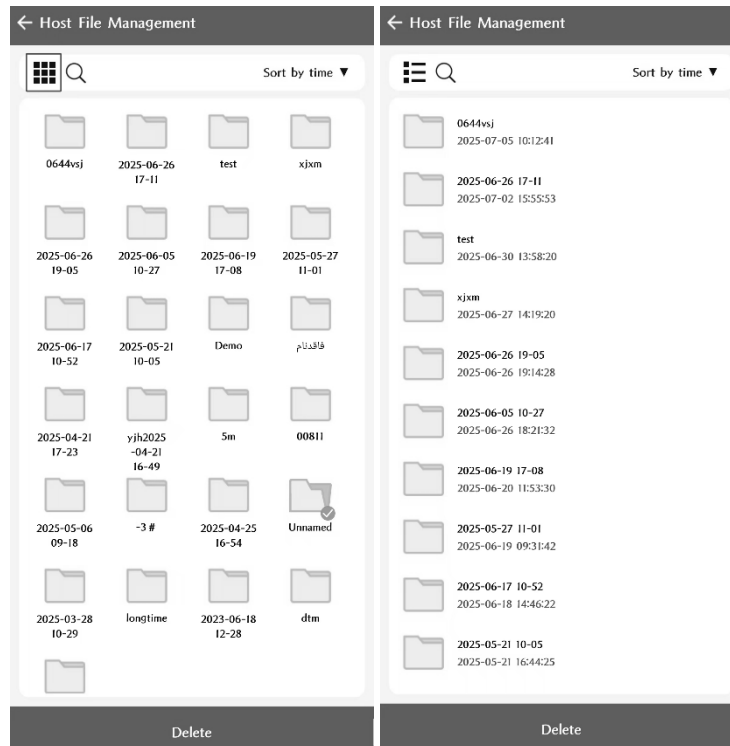


Figure 4-3-27

Figure 4-3-28

The software displays projects in descending order of usage time by default. When users click the sort button, a pop-up window appears offering options to sort by name ascending, descending, usage time ascending, or descending. Users can select their preferred sorting method from this window to organize the projects.

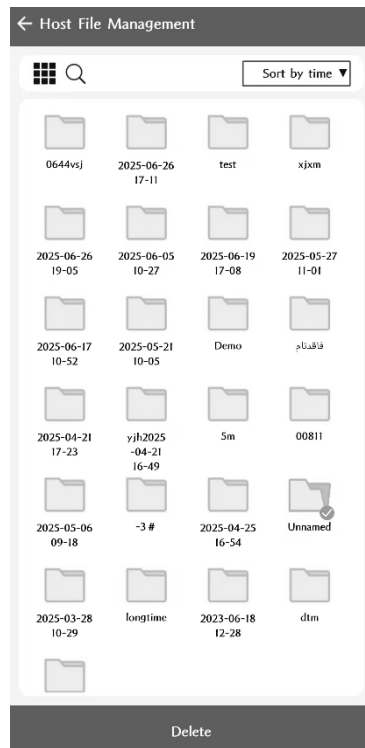


Figure 4-3-29

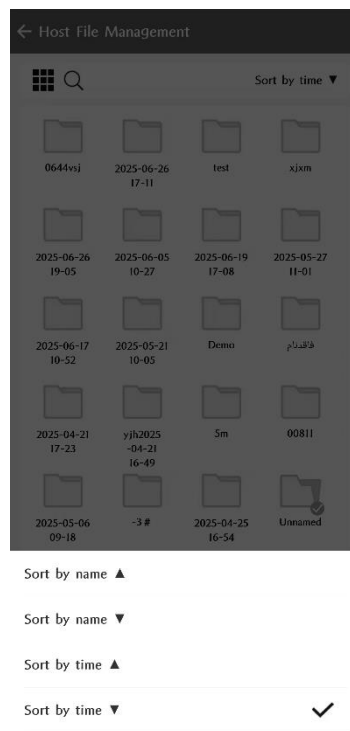


Figure 4-3-30

[Search] Click to enter keywords to perform a fuzzy search of project names.

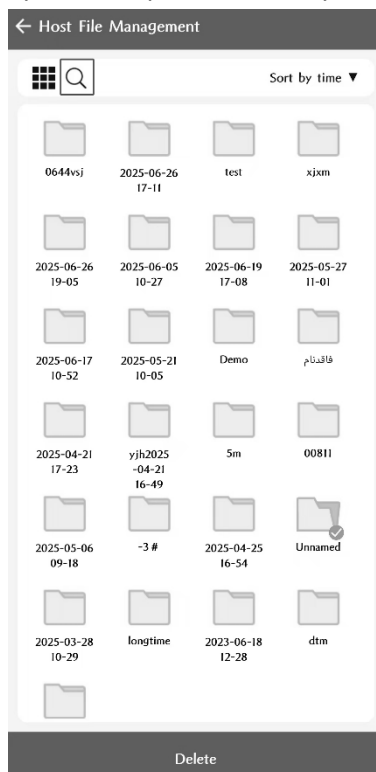


Figure 4-3-31

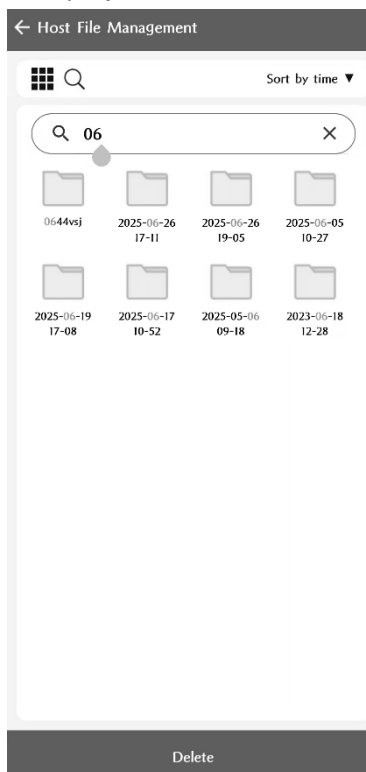


Figure 4-3-32

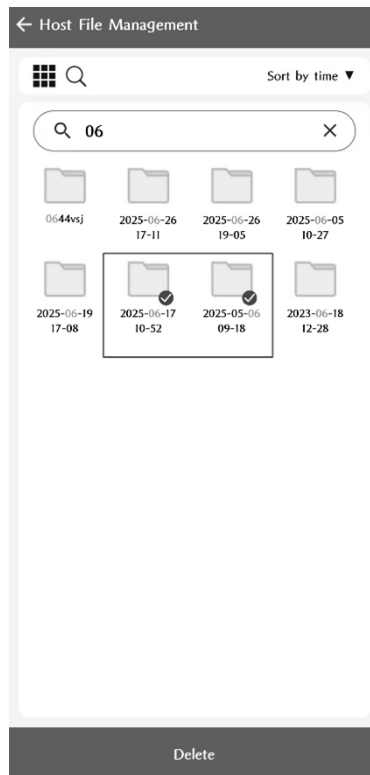


Figure 4-3-33

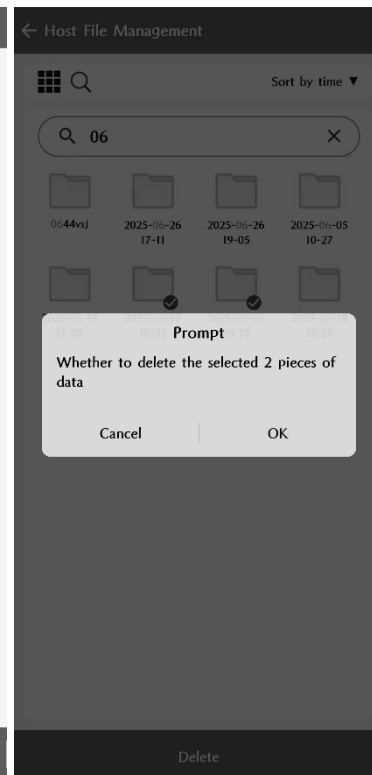


Figure 4-3-34

4.4 Download job data

Use the accompanying USB data cable to connect to the computer's USB3.0 interface when the device is off. Enter the static disk symbol recognized by the computer, enter the slam folder and select the corresponding project file for copying.

Among them, the slam file is the real-time data of SLAM RTK product. The data folder in the task folder of each project contains the original data of camera, board card, IMU, LiDar and motor, the result folder is the result data and trajectory data of real-time point cloud maintenance, and point_data.csv is the coordinate data collected during the operation process.

The project file supports the post-processing software Hi-LiDar of Hi-Target.

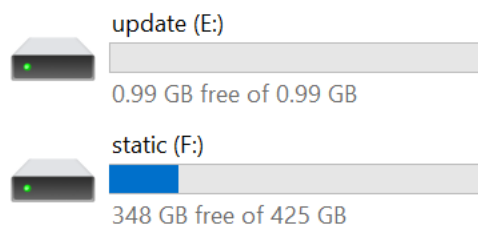


Figure 4-4-1

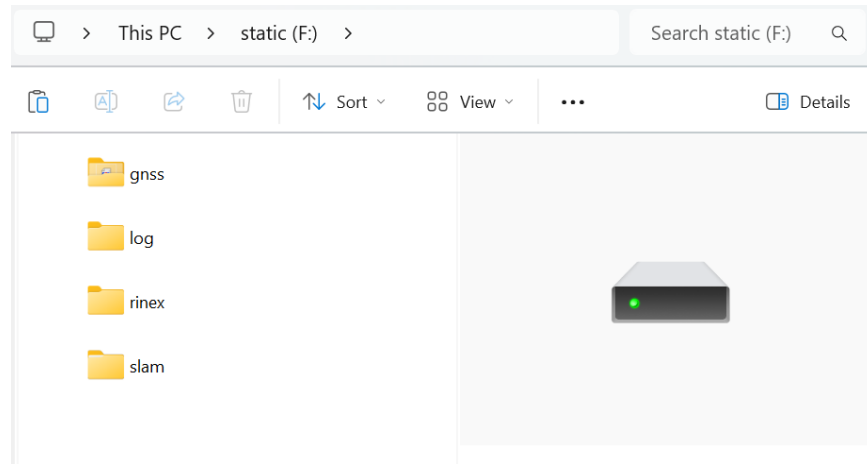


Figure 4-4-2

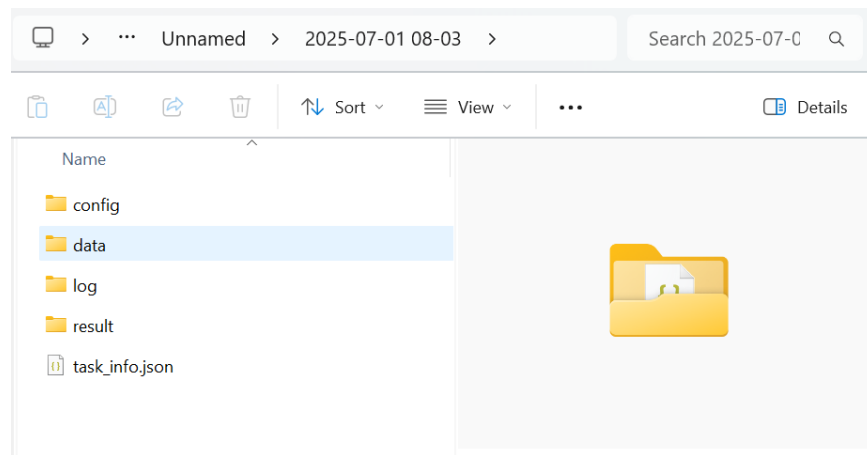


Figure 4-4-3

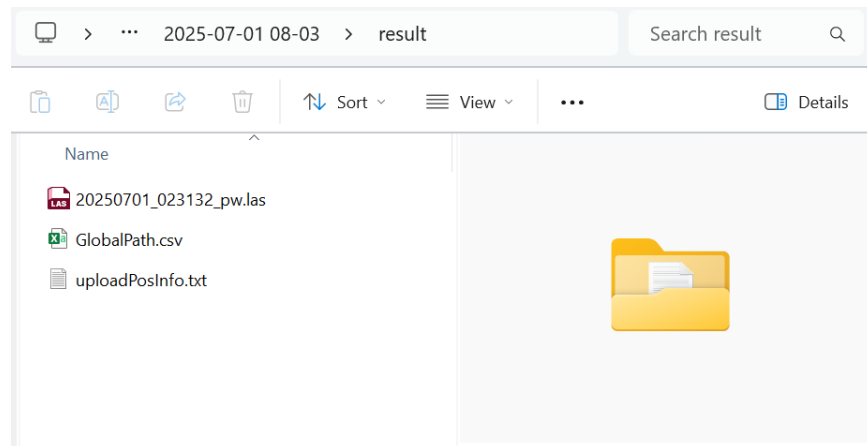


Figure 4-4-4

SLAM RTK product data path

4.5 Data processing

This product can be processed by Hi-LiDar post-processing software to optimize the collected point cloud data. The specific steps are as follows:

4.5.1 New construction

1. Click file/New project, fill in the project name and select the original data directory file;
2. The original data does not need additional processing, and can be directly imported into one-click calculation;
3. Select the data directory to the root directory of the original data.

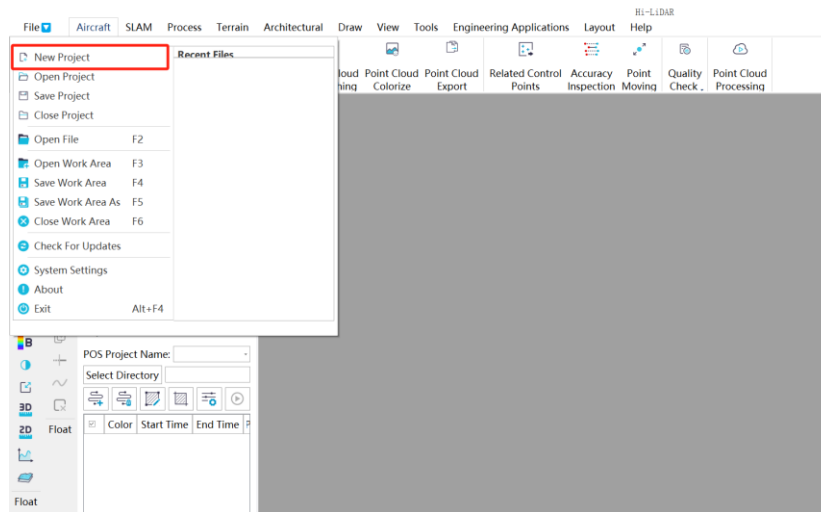


Figure 4-5-1

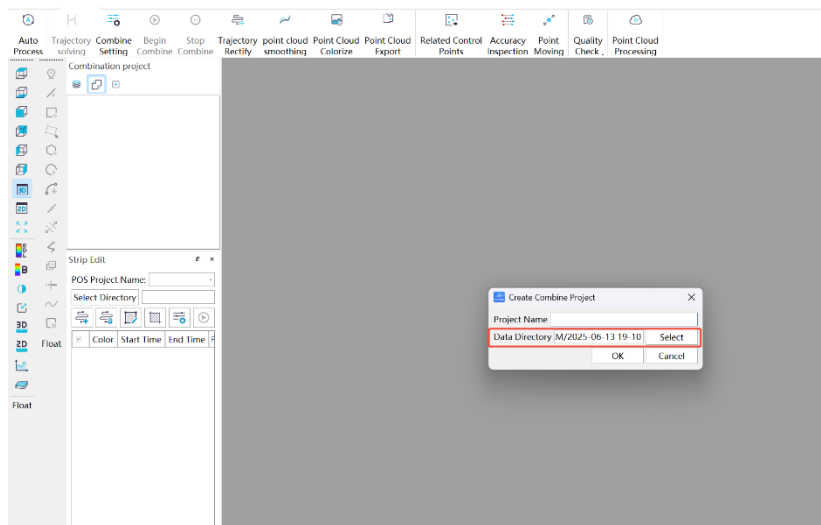


Figure 4-5-2

new construction

4.5.2 Configure the coordinate system

Click [Coordinate System Configuration] in [Point Cloud Calculation], select the coordinate system parameter file in the directory to set the coordinate system parameters. Click OK

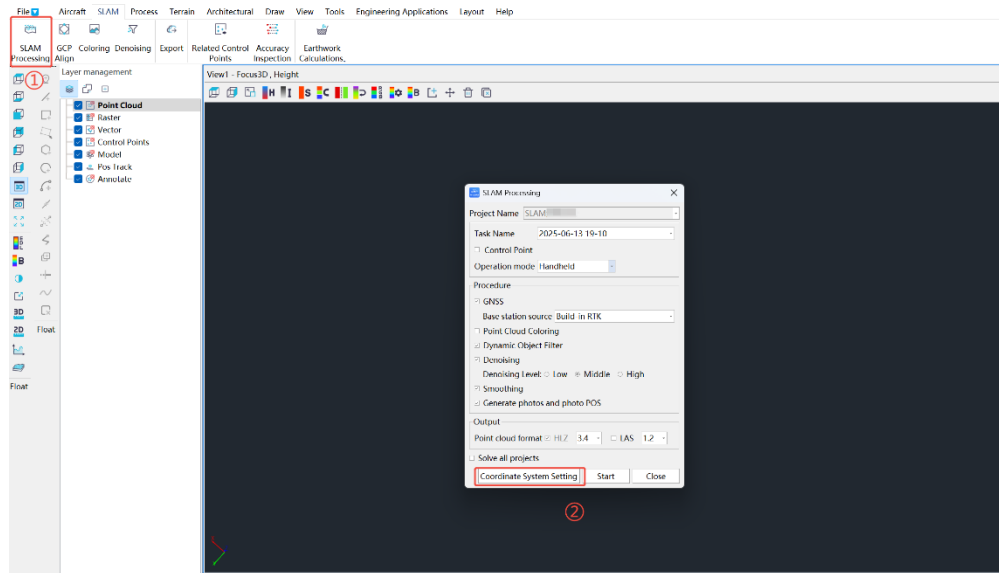


Figure 4-5-3

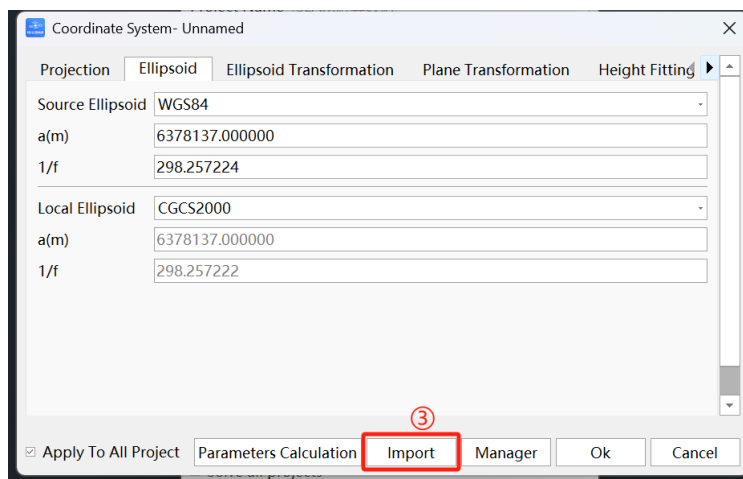


Figure 4-5-4

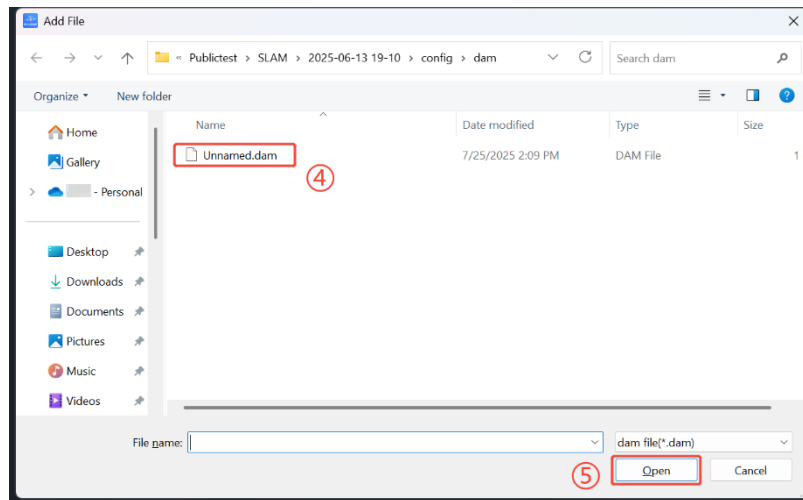


Figure 4-5-5

Configure the coordinate system

4.5.3 Point cloud solution

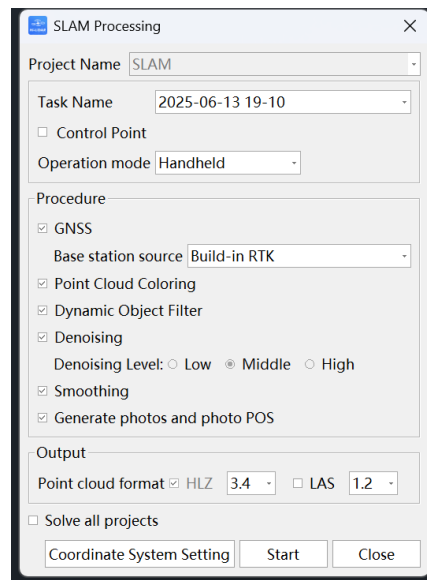


Figure 4-5-6 Point cloud solution

Set the operation mode, point cloud format, click the solution, and wait for the successful data processing;

Control point setting: Add control points to improve the trajectory accuracy and obtain the results of absolute coordinate system.

PPK setting: the position is corrected by PPK post-processing technology, and the point cloud of the relative coordinate system is converted into the absolute coordinate system;

Coloring of point cloud: the point cloud data and image are aligned to obtain real colors and then attached to the point cloud;

Point cloud denoising: remove the noise of point cloud anomalies, retain the real geometric features, and improve the accuracy and reliability of point cloud;

Output point cloud: supports output of multiple point cloud formats;

Solve all projects: support one-click solve multiple projects;

4.5.4 Calculation of cutting and filling

Click [Terrain] [Earthwork Calculation] in the menu bar, select the calculation range, enter the base elevation and grid size, and click calculate.

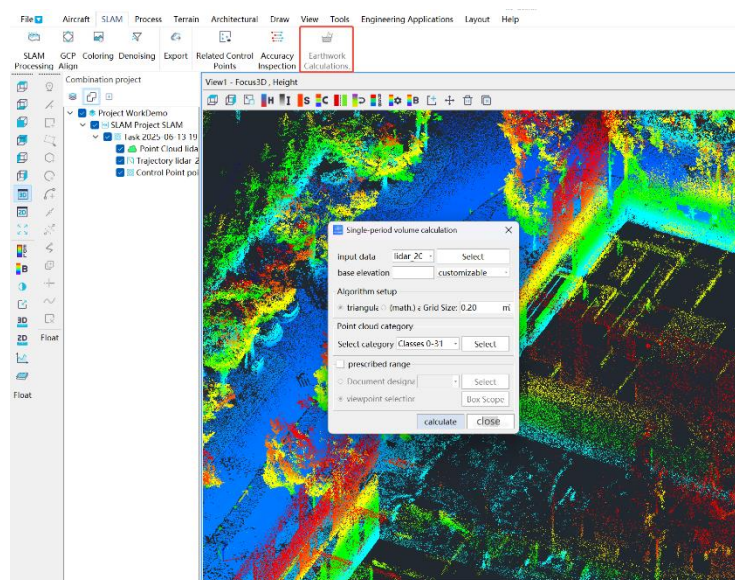


Figure 4-5-7

Preview of calculation results and export of reports;

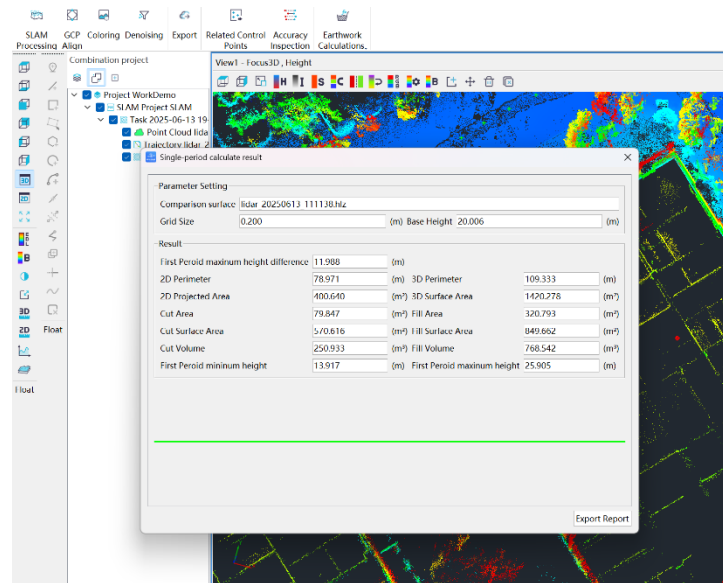


Figure 4-5-8

Radio	Frequency range	Modulation	Transmit Power
NFC	Receiver: 13.56MHz	ASK	N/A
Radio	Transceiver: 410 MHz to 470 MHz	4FSK, GFSK	36.89 dBm ERP
BT LE	Transceiver: 2402MHz to 2480MHz	GFSK	8.7 dBm EIRP
2.4G WIFI	Transceiver: 2412MHz to 2472MHz	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11ax: OFDM/OFDMA (1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK)	20.1 dBm EIRP
GNSS	Receiver: BDS B1I; GPS L1; GLONASS G1; Galileo E1; GPS L5; GLONASSG2; Galileo E5	QPSK	N/A
5G WIFI	Transceiver: 5180MHz to 5320MHz	OFDM/OFDMA	22.55 dBm EIRP
5G WIFI	Transceiver: 5500MHz to 5700MHz	OFDM/OFDMA	23.68 dBm EIRP
5.8G WIFI	Transceiver: 5745MHz-5825MHz	OFDM/OFDMA	11.30 dBm EIRP
GSM	Transmitter: 880 - 915MHz	GMSK(GSM/GPRS)	35dBm Conducted
GSM	Transmitter: 1710 -1785MHz	GMSK(GSM/GPRS)	32dBm Conducted
LTE	Transmitter: 1920-1980MHz	QPSK, 16QAM	25dBm Conducted
LTE	Transmitter: 1710-1785MHz	QPSK, 16QAM	25dBm Conducted
LTE	Transmitter: 2500-2570MHz	QPSK, 16QAM	25dBm Conducted
LTE	Transmitter: 880-915MHz	QPSK, 16QAM	25dBm Conducted
LTE	Transmitter: 832-862MHz	QPSK, 16QAM	25dBm Conducted
LTE	Transmitter: 703-736MHz	QPSK, 16QAM	25dBm Conducted
LTE	Transceiver: 2570-2620MHz	QPSK, 16QAM	25dBm Conducted
LTE	Transceiver: 2300-2400MHz	QPSK, 16QAM	25dBm Conducted
LTE	Transceiver: 2496-2690MHz	QPSK, 16QAM	25dBm Conducted