

RobotSLAM Lite User Manual



SOUTH SURVEYING & MAPPING TECHNOLOGY CO., LTD.

2023.12

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1. Getting to know RobotSLAM Lite

1.1 Unboxing



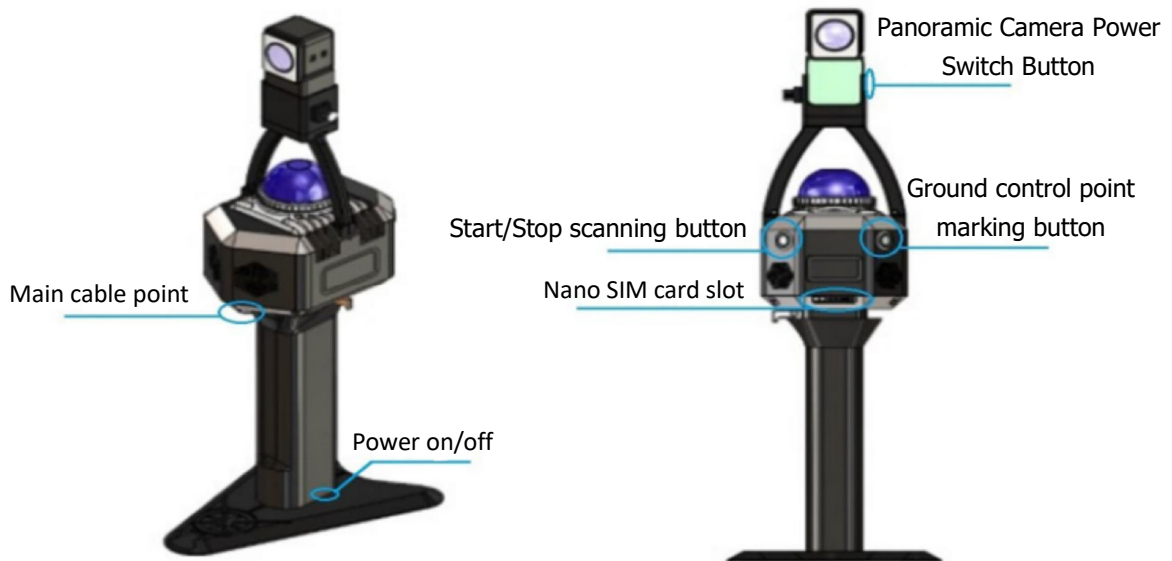
ID	Part Name	Quantity
A	Device	1
B	Handheld Rechargeable battery	1
C	Base stand	1
D	Pano Camera Unit	1
E	Camera Holder	1
F	Lens Cover	1
G	Battery Charger	1
H	Type-C charging cable	1
I	Ethernet Cable	
J	Cleaning cloth	1
K	Hand-carry case	1

1.2 Technical specifications

Specification	Parameter
Models	RobotSLAM Lite
System accuracy	2cm
Laser safety class	CLASS 1
Measuring range	0.1 ~40m@10% 0.1 ~70m@80%
FOV(horizontal)	360° , -7°~52°
Angle resolution(H.)	0.15° (10 Hz)
Scanning frequency	10 Hz
Scan Rate	200,000points/sec
Storage	Built in storage: 512G SSD
	Camera built in storage: 128G TF
Weight	1.2 kg (without camera)
	1.32kg (with camera)
Induration time	Single battery≥2h (add to
Environment	-20°C~65°C (working) /-40°C~85°C (storage)
Data acquisition time to data processing	1:1

2. Device details

Device interface display



ID	Port Name	Functions	descriptions
1	Start/Stop scanning button	Start/Stop scanning	the button is to control the device to start scanning or stop scanning; During data acquisition, the blue light remains steadily on.
2	Ground control point marking button	press once to record the current ground control point location	place the device on the ground control point marks, and press the button shortly one time to record the GCP location
3	Main cable point	9-pin data interface, UDP/IP Gigabit Ethernet	Use with data cable
4	Nano SIM card slot	SIM card	Supports 4G communication with an insertable mobile communication card.
5	Controller battery	DC 12V ~ 16.8 V	please use the standard battery
6	Camera power button	Start/Stop scanning	Do not use the device while it is charging.

LED screen display



ID	Item	Content	Description
1	Device status	Connecting cam!	Connecting to camera...
		Ready to scan!	Device is ready, scanning can commence
		Initializing	Initializing collection, lasting 10 seconds
		Storing data...	Data is being stored, please wait...
		Marking pt	Recording control point, lasting 5 seconds
		Ending...	Ending collection, lasting 10 seconds
		Saving image...	Camera data is downloading, please wait...
2	time	h: m: s	Display local time when not collecting; Display current collection duration during collection

2.1 Device connection

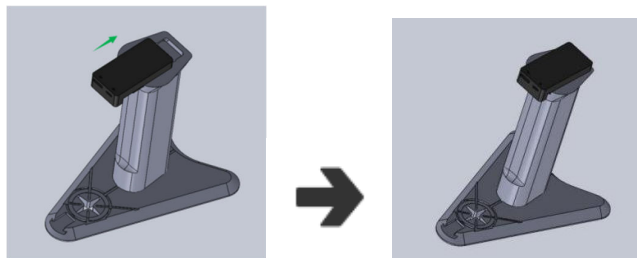


1. Connect the handle battery and the base using imperial bolts.
2. Details about the handle battery.



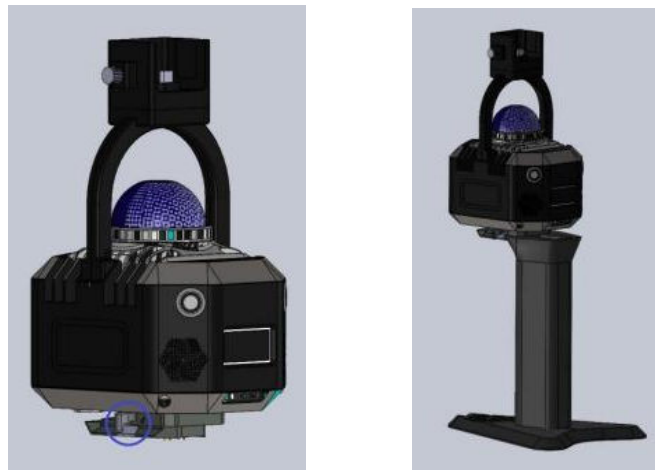
Press the power switch lightly, the light on the handle battery indicates that it is turned on; press it briefly and then hold it until the light goes out to indicate that it is turned off.


The handle battery is a 18650LiPo, with a capacity of 2400mAh and energy of 34.56Wh.




Install the charging module as shown in the diagram, and use the Type-C interface to connect the external power supply for charging the handle.

3. Connect the host and the handle battery.



(1) Turn the locking handle of the device to the “” mark side, then insert the slide rail into the slide slot of the handle battery. When the top of the slide rail is against the end face of the slide slot, it is installed in place.

(2) Rotate the locking handle to the side with “”, and tighten it until the

device is not loose.

(3) When disassembling, rotate the locking handle in the opposite direction to loosen it, and gently pull out the device.

4. Connect the camera and the host.



Insert the camera into the socket at the top of the device, press down to align the Type-C interface, and the camera is fixed without shaking.

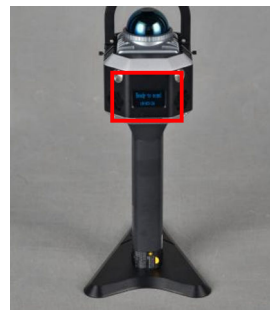
For disassembly, do the opposite.

2.2 Data capture

1. Press the power button and LED light is on;



Press power button



LED light ON

2. Press the camera power button, wait for the LED screen change from 'Connecting cam!' to 'Ready to scan!' and the camera is on.

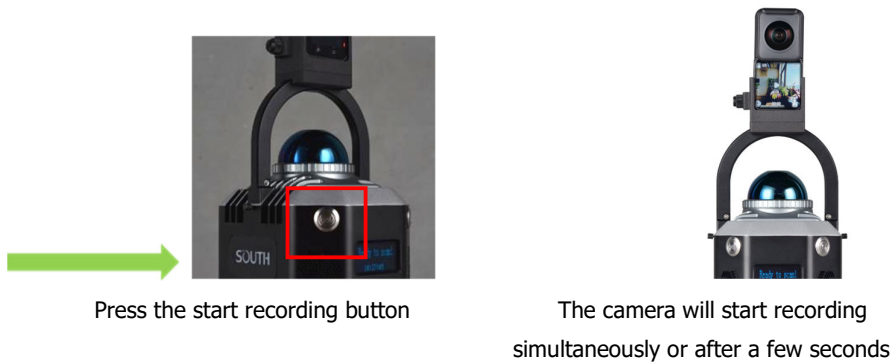


press the camera power button



Camera ON

3. Go to the start point, put the instrument on the ground(flat ground);



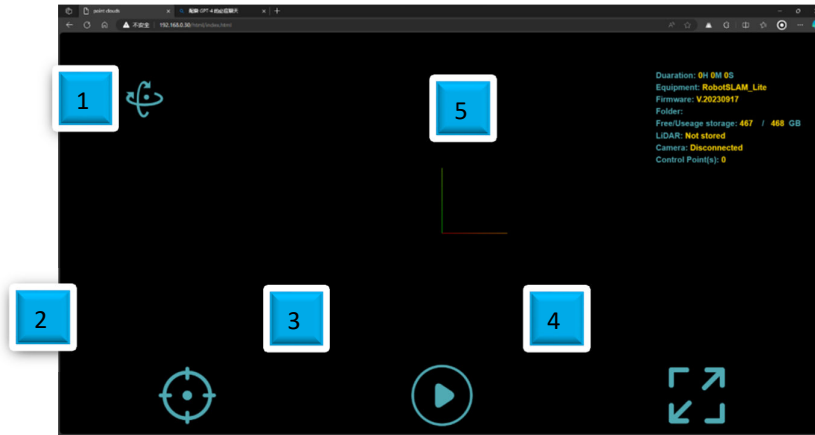
4. After starting the scan, please keep the instrument in one place without moving for 10s, and then start scanning;



5. when finishing the scan, keep the instrument in the same place without moving for 10s too, and then press the start recording button again to stop the scan.

- Notes:**
1. When initializing, don't move the instrument;
 - 2.Keep the instrument in front of the operator in scanning process.

APP: Explanation of the app main interface



1. Viewpoint switch: free rotation → third person → first person;



Free rotation



Third person



First person

2. Set control points during collection;
3. Control the device to start/stop collection;
4. Automatically adjust the scale according to the loaded point cloud;
5. Real-time status display of the device.

3.Data download

1. Data download Via Ethernet Cable



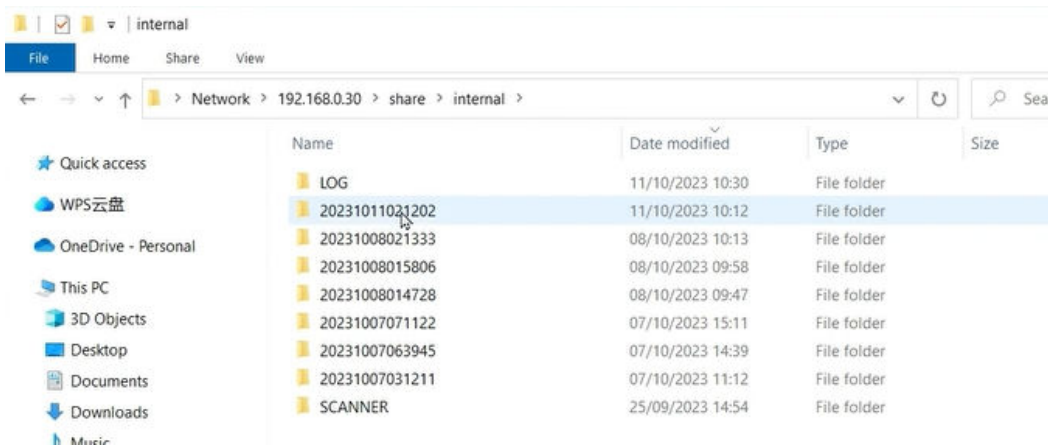
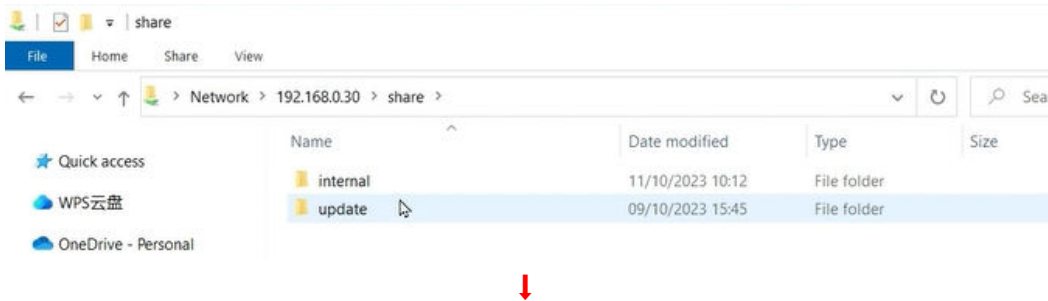
Ethernet cable



Connect RobotSLAM lite with laptop or computer

Input [\\192.168.0.30](http://192.168.0.30) in your computer





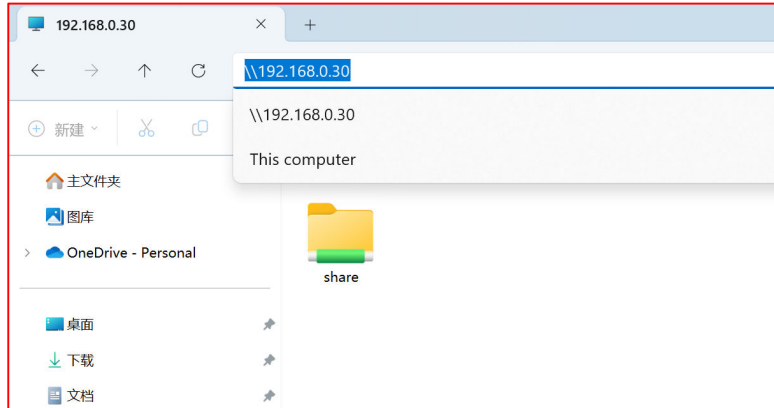
Copy out the data folder, all the information is in the same folder.

2. Data download via WiFi

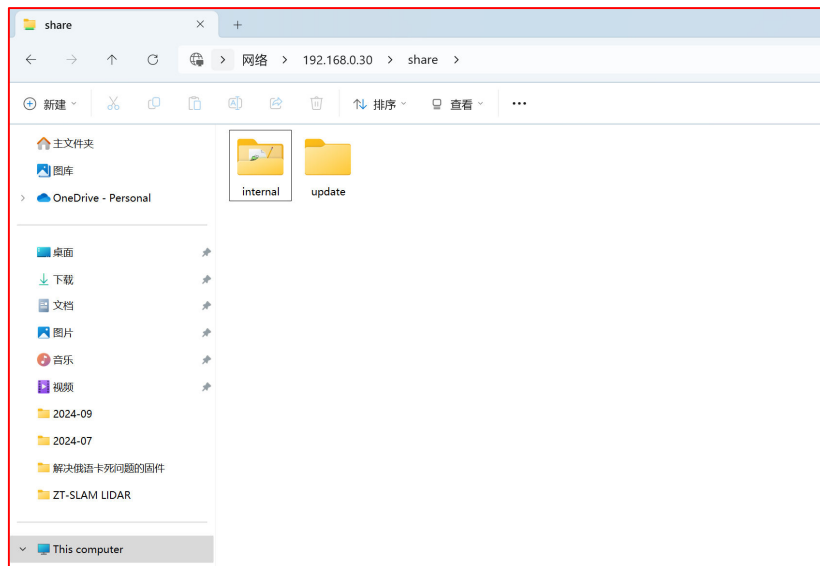
Connect device Wifi with Laptop,



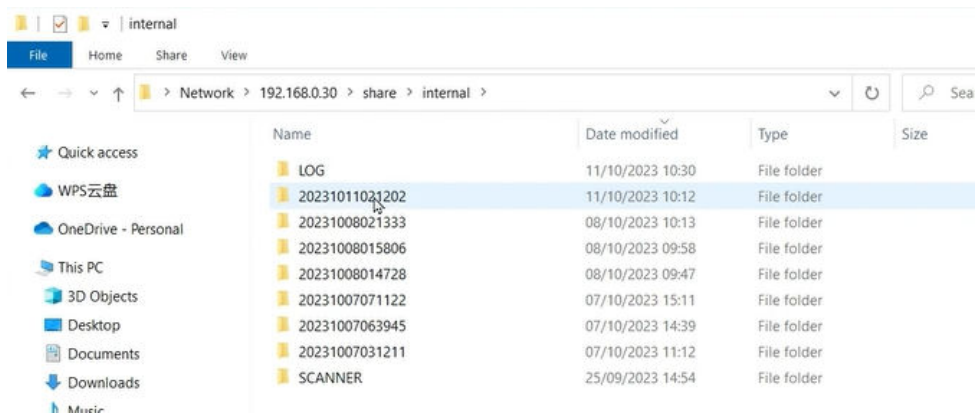
Connect device wifi, password is 12345678,
Enter the share folder:



And then open internal folder



Copy out the project folder:





4.Data processing

4.1 Computer configuration


Computer	Minimum	Recommended
Operating system	Windows10/Windows11 64-bit	
Graphics card	GTX-3060/RX6600M or above (NVIDIA series recommended)	
CPU	Intel i7-11800H/AMD R7-5800H or above	Intel i7-12700H/AMD R7-6800H or above
Internal Memory	16GB or above	32GB or above
SSD	1TB or above	2T or above

4.2 RobotSLAM Engine software installation

Before start processing, there are two software to install,

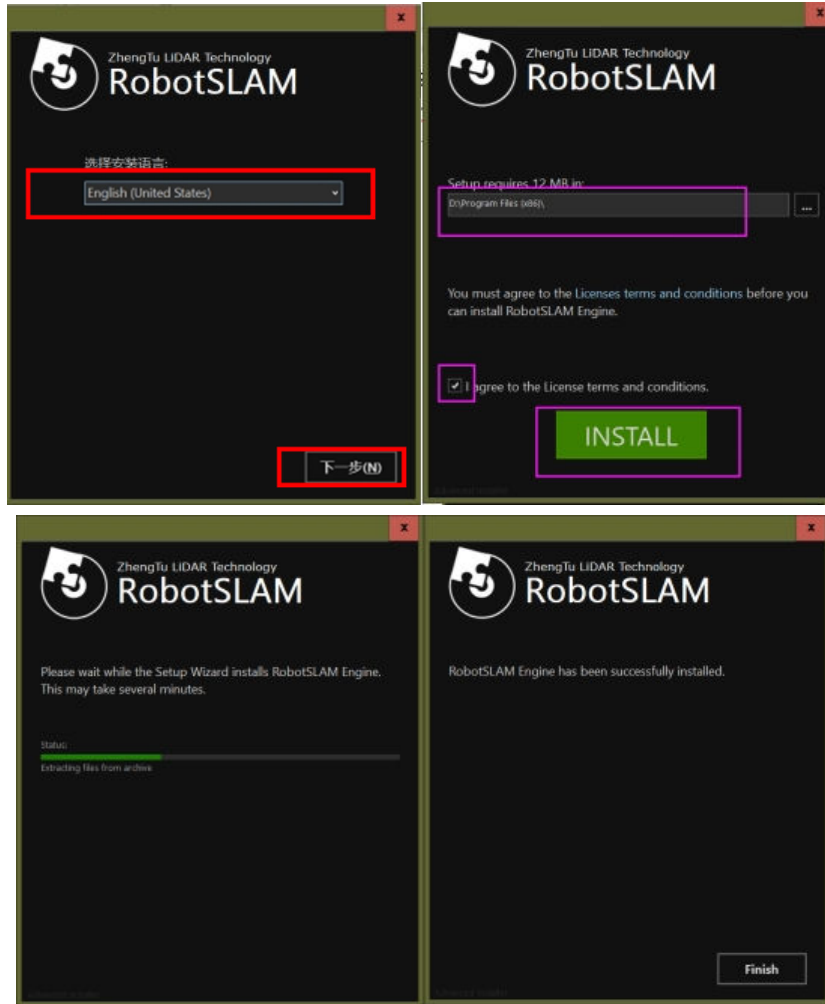
 RobotSLAM Engine_V1.2.5-Update-EN	2023/12/12 10:59	应用程序
 RobotSLAM_Server_V1.0.1-Setup-x64-EN	2023/11/23 15:44	应用程序

1st, double click”  ” to install it;

2nd, double click”  ” to install it, select “English(US) or English(UK)”;

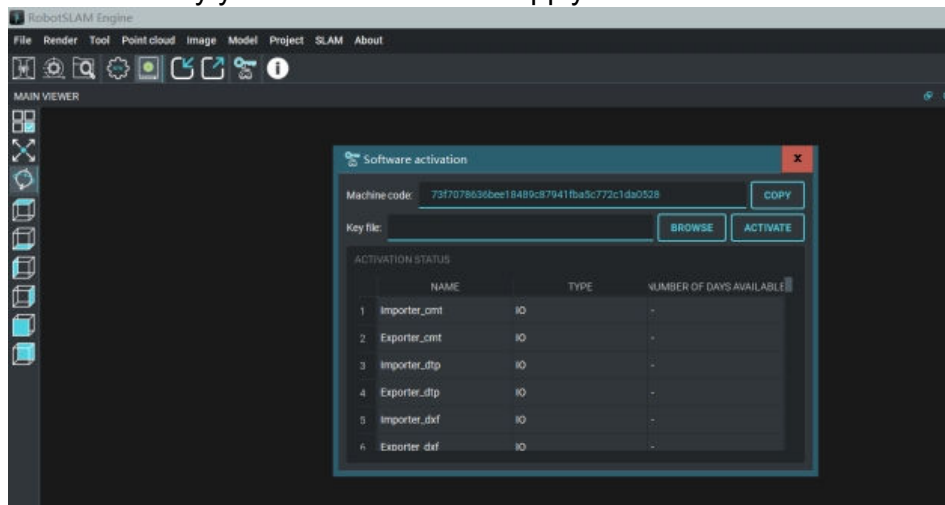
click “ Next ”; set the installation path,

The postprocessing software is **RobotSLAM Engine**. 



4.3 Apply a software license

1. send the factory your machine code to apply a license file:

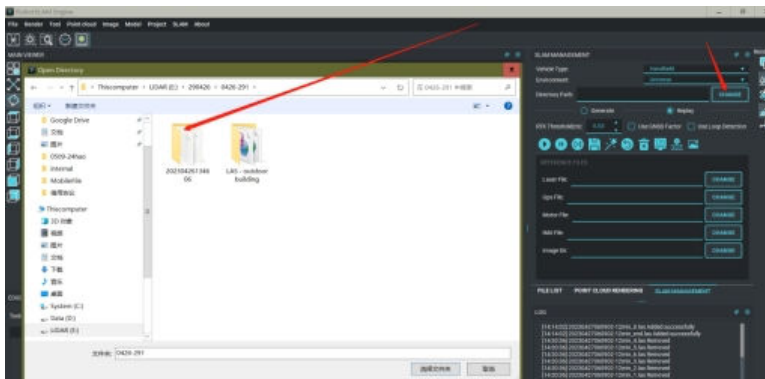
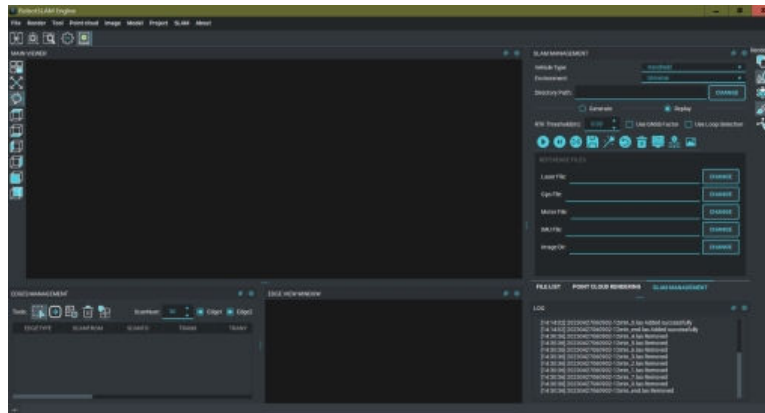
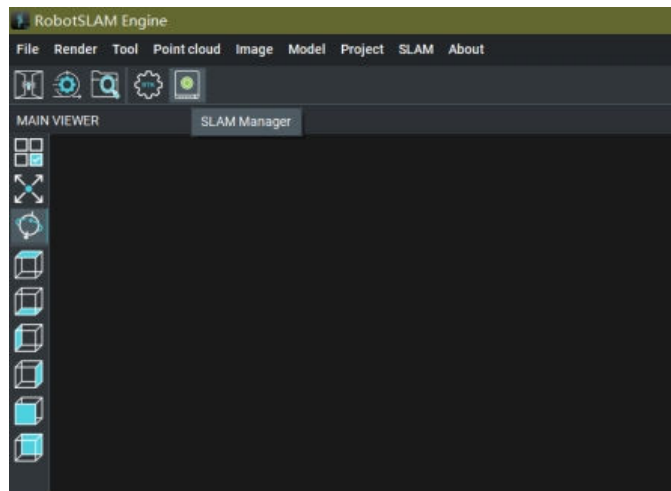


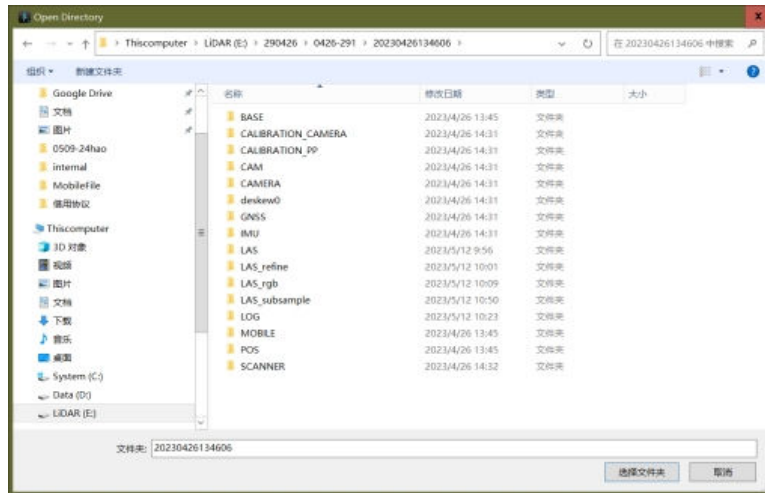
2.click “BROWSE” to import the license file and click ACTIVATE;

4.4 Data processing in RobotSLAM Engine software

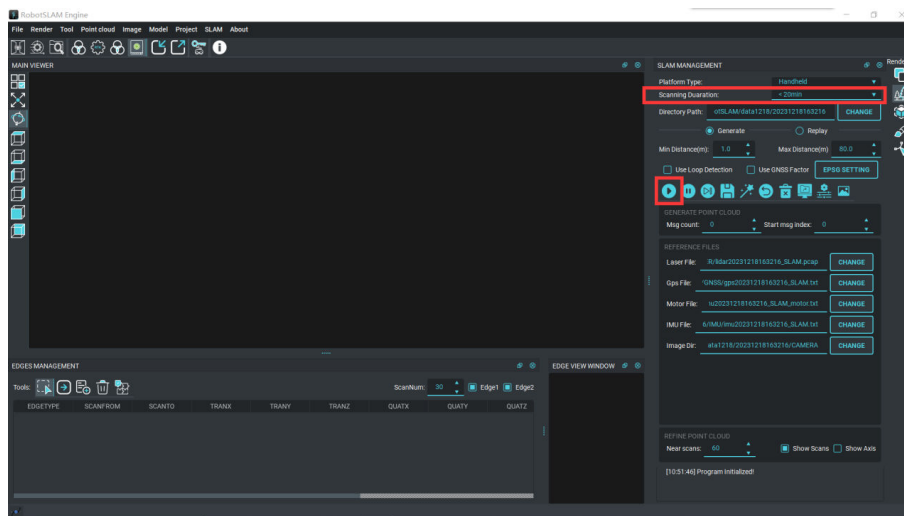
1st , Double click to run RobotSLAM Engine software 

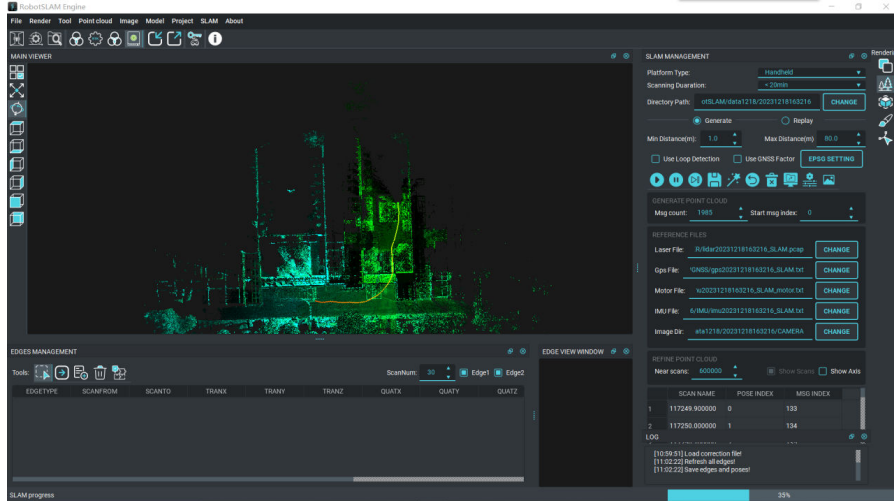
2nd , Open SLAM Manager, click” CHANGE” to load the project folder;



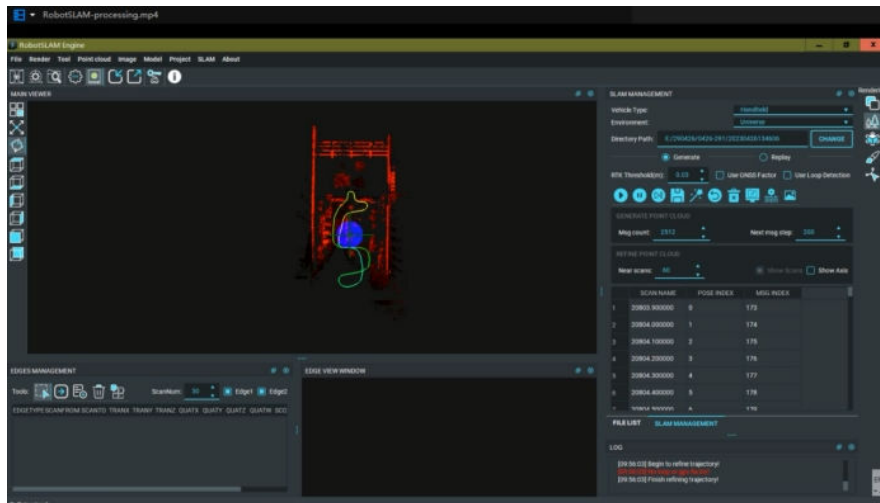


3rd, if the total scanning time is less than 20 minutes, directly click “Run Bag file” (Environment keep the default value “<20min”); if the scanning time is more than 20 minutes, Environment set “>20min”, and then click” Run Bag file”.

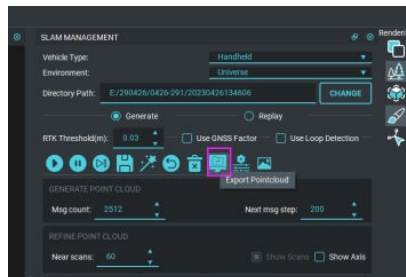




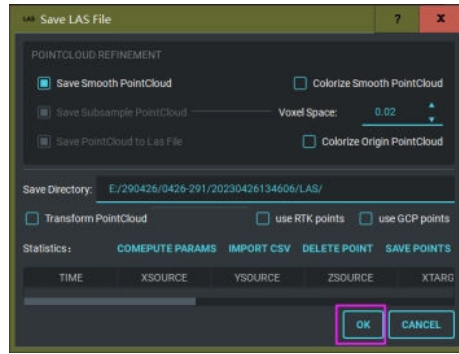
4th, wait for the processing, when the processing bar reach 100%, and show **“Finish refining trajectory”**, the processing finish.



5th, **Export point cloud** by clicking the following icon:

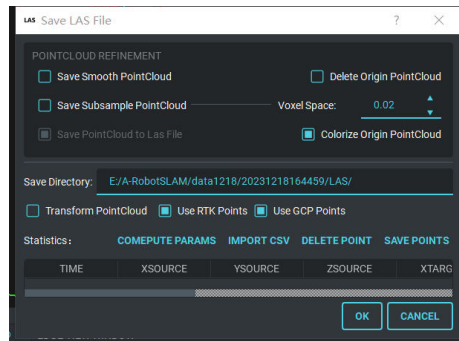


6th, and then click “OK” to export point cloud.



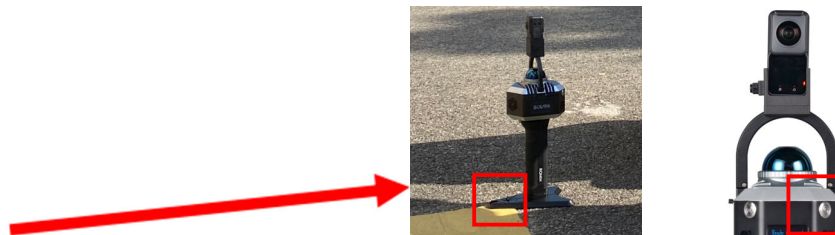
4.5 Export colored point cloud

If the data also collect video with the panorama camera, check “Colorize Origin Pointcloud” to export the point cloud, and then click OK.



4.6 Export absolute coordinates

1. If marks GCPs in the scanning process,



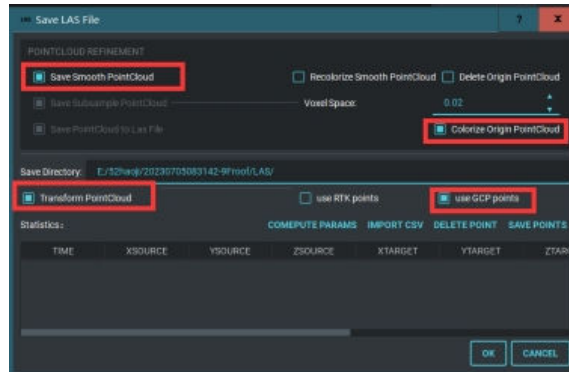
Marking GCPs on the ground

Method to mark ground control point:

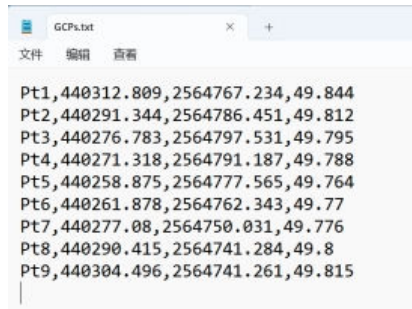
1. Put the cross on the base plate to the location of the ground control point;
2. Press the **BLACK BUTTON** on the RobotSLAM to record the ground control

point.

If some Ground Control Points are marked and get the coordinates file for the GCPs, please check” **Transform Point Cloud**” and “**Use GCP points**” to export absolute coordinates;

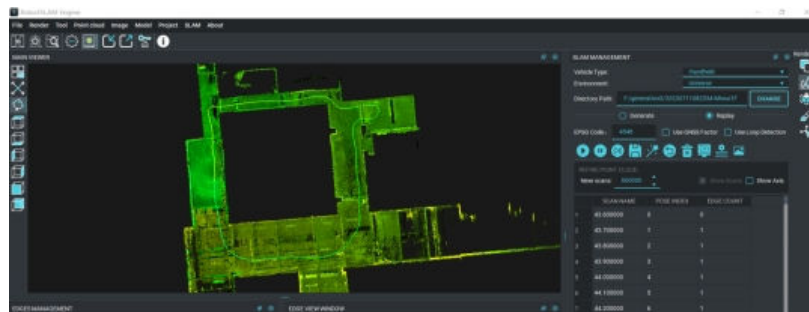


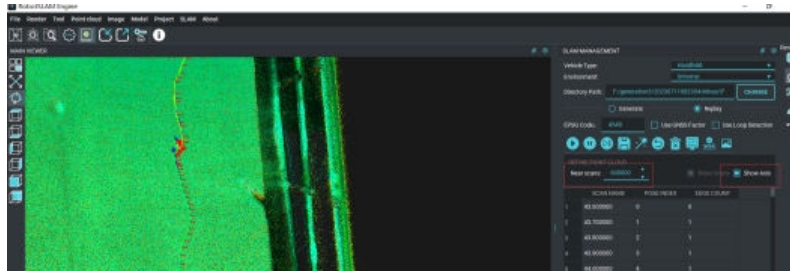
The GCPs coordinate file should be *.txt or *.csv format, in the sequence of **Point name, E, N, Z:**



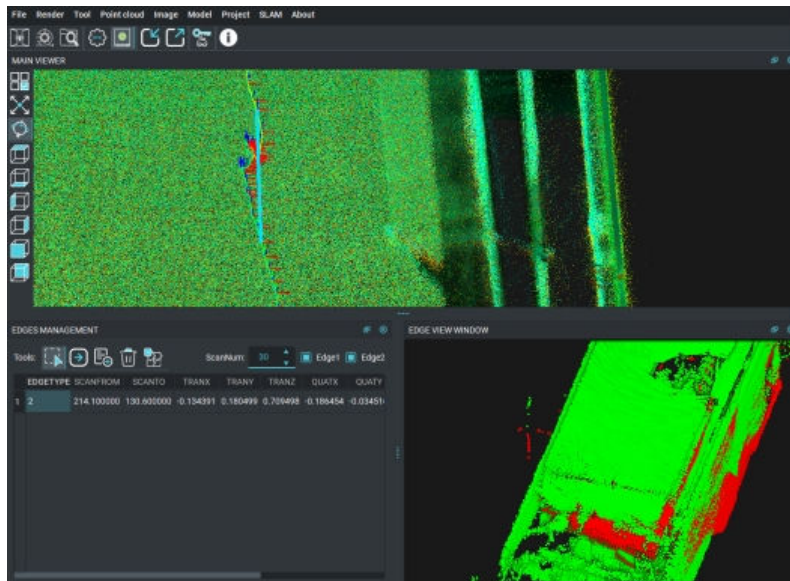
4.7 Loop optimization

When finish processing, zoom in the left window to the location of start scanning point, increase the value of “Near scans” and check “Show Axis”,

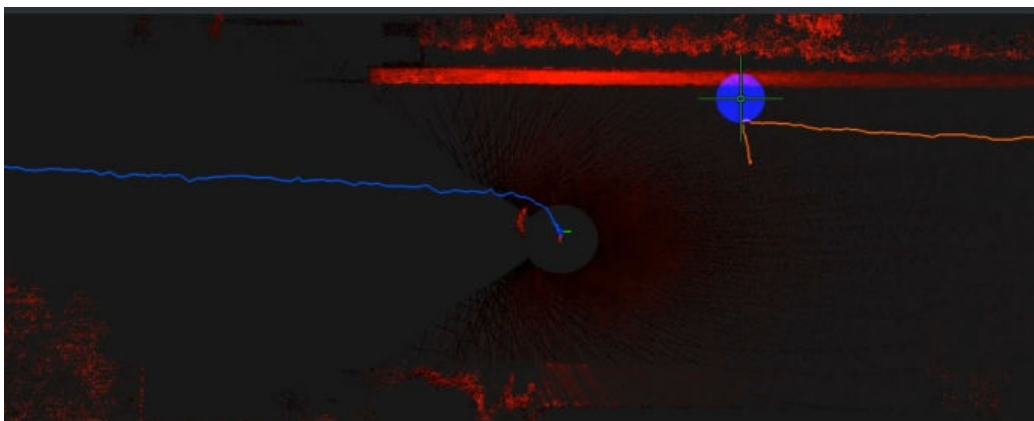




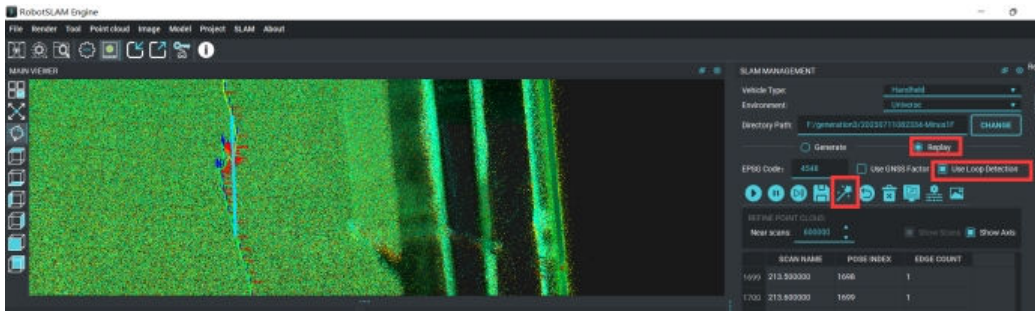
Click one point on the starting line, and one point on the ending line, so that check whether the point cloud is misaligned in the joint area. Under normal status, in the joint area, there is only one layer of ground point cloud from vertical view; if there two layers of ground point cloud, it is abnormal and need to be adjusted.



If the point cloud is misaligned or point cloud has deviations in joint area, please adjust with **LOOP DETECTION** method to optimize the point cloud:



The starting point and ending point don't go to the same position.

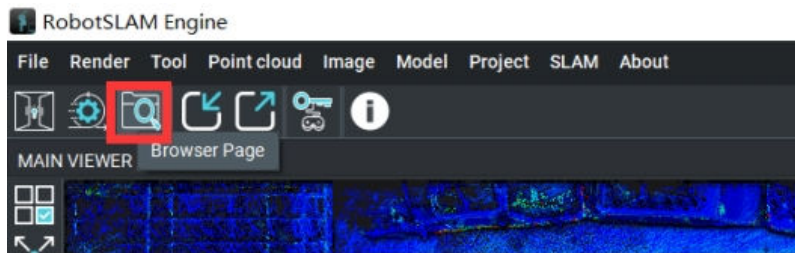


Optimize the point cloud with LOOP DETECTION optimization.

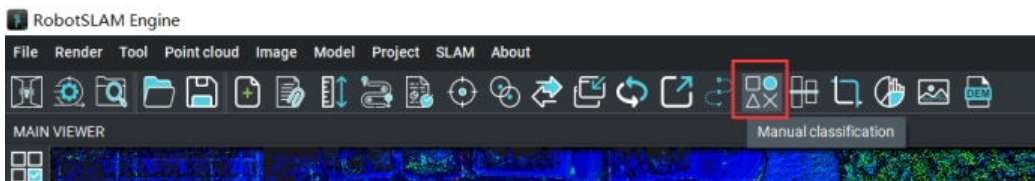
4.8 Point cloud classification(manually)

This function is used to classify the point cloud manually, for example class one unclassified point cloud to ground, vegetation, building, noise and so on.

Take Low point(noise points) classification as an example:



Browser Page



Manual classification



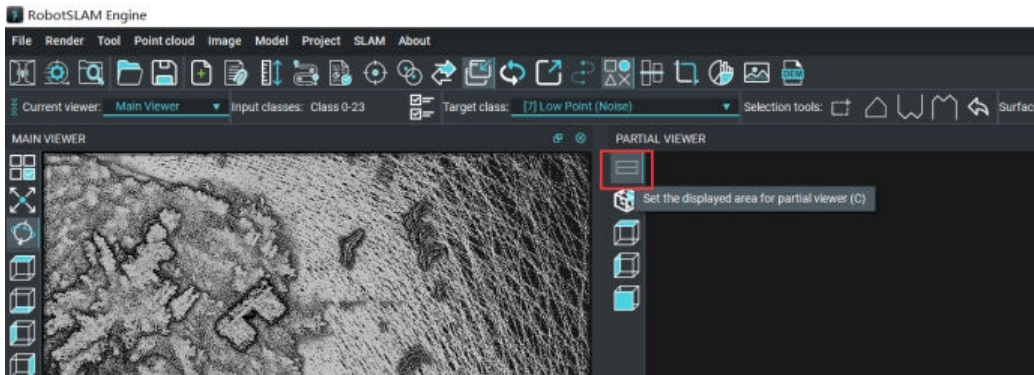
set Target class



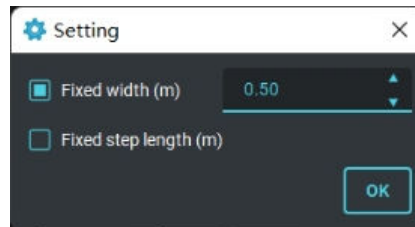
select "Low point(noise)" for example(or other class)



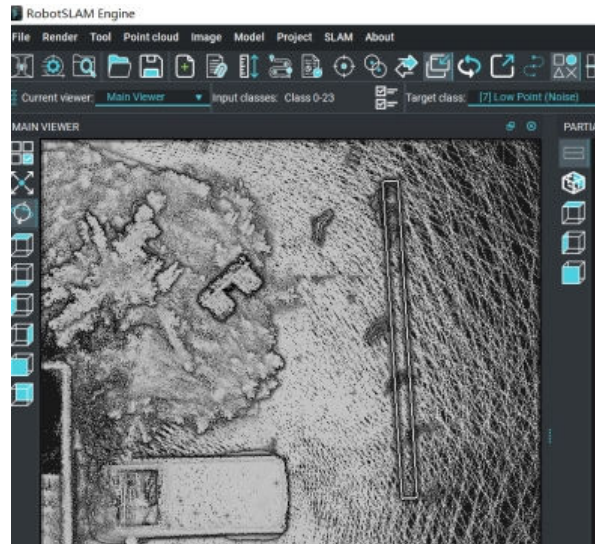
click "Partial Viewer"



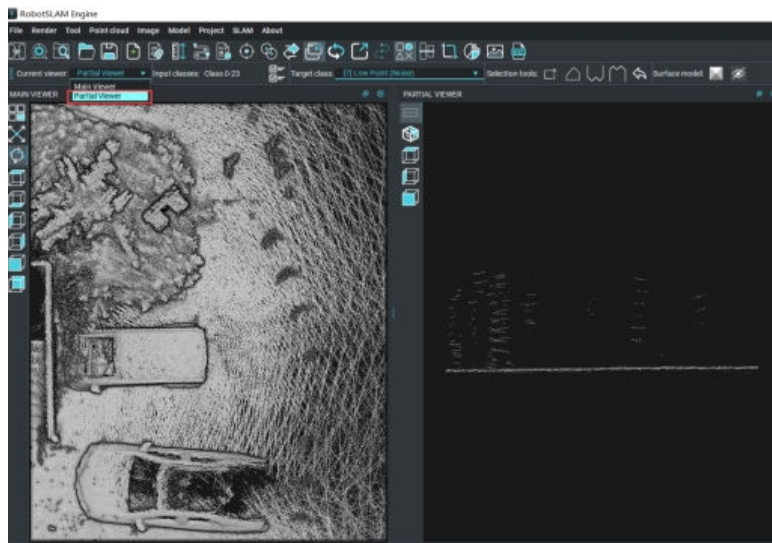
right click" Set the displayed area for partial viewer"



set Fixed width value(0.1-0.5)



make a slice in left window with left mouse button



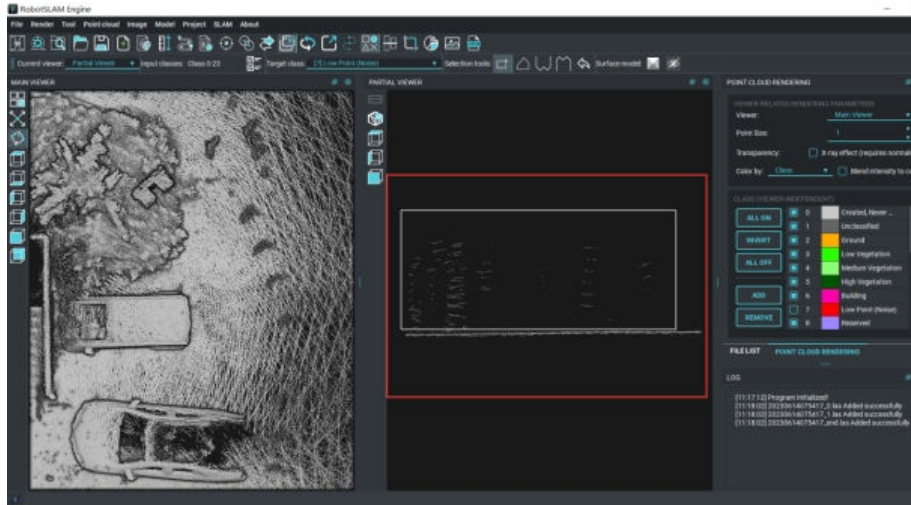
change the classification window to Partial Viewer (it is the right window)



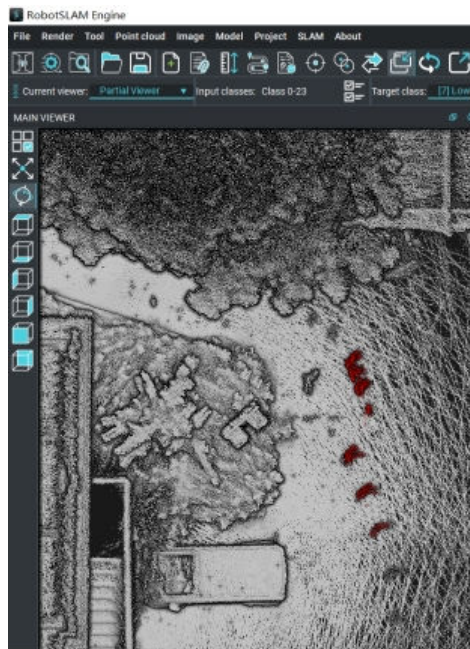
Select the "Selection tools"



Select tool "Rectangular" or other tools on the right



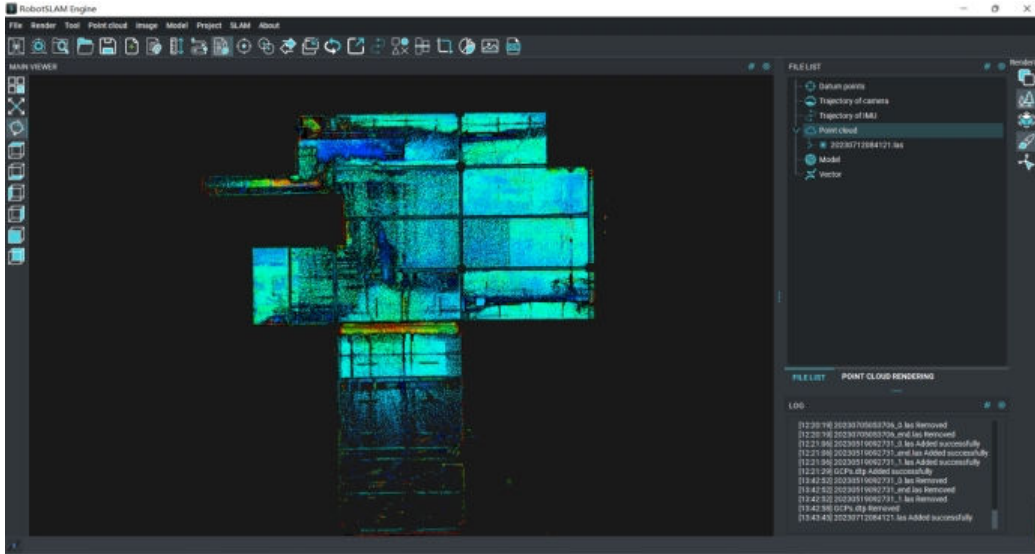
class the noise point cloud to Low point class



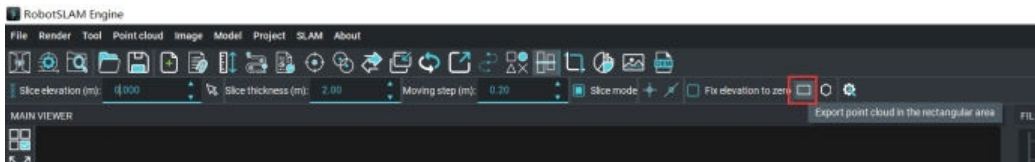
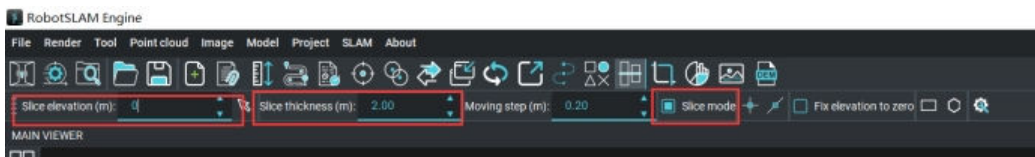
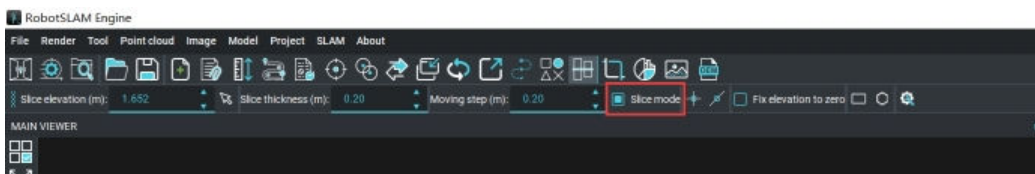
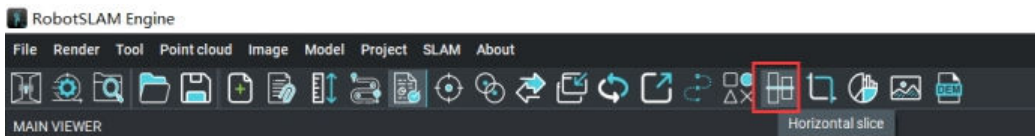
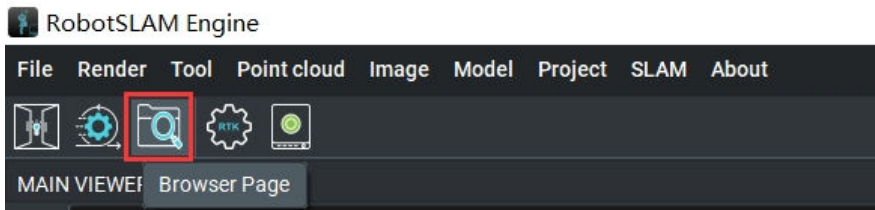
The low point class (in red color in left window)

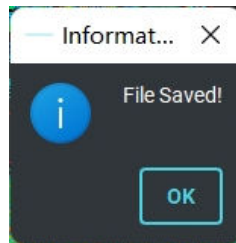
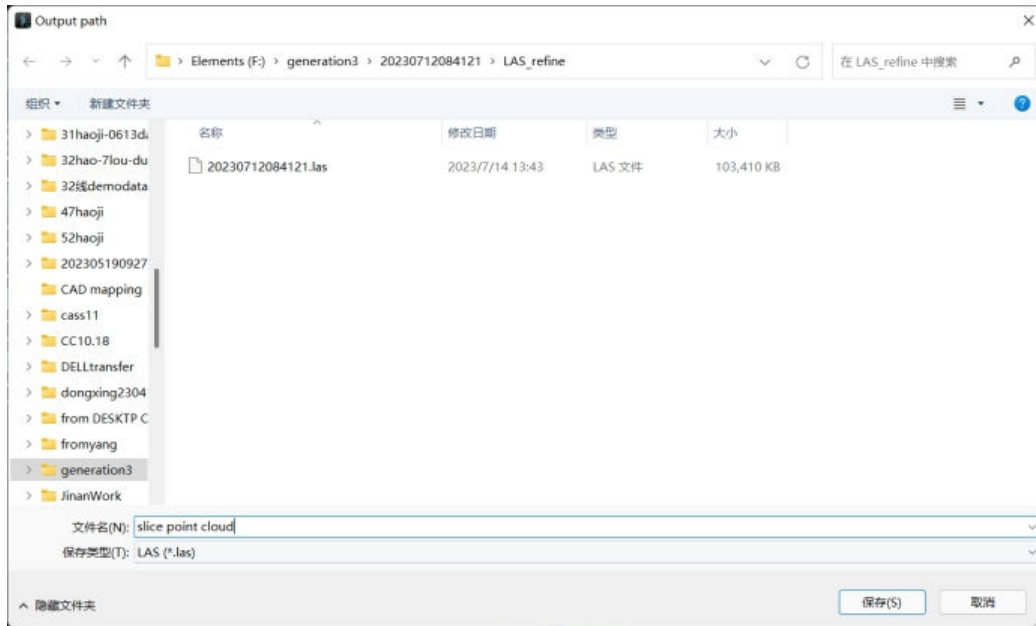
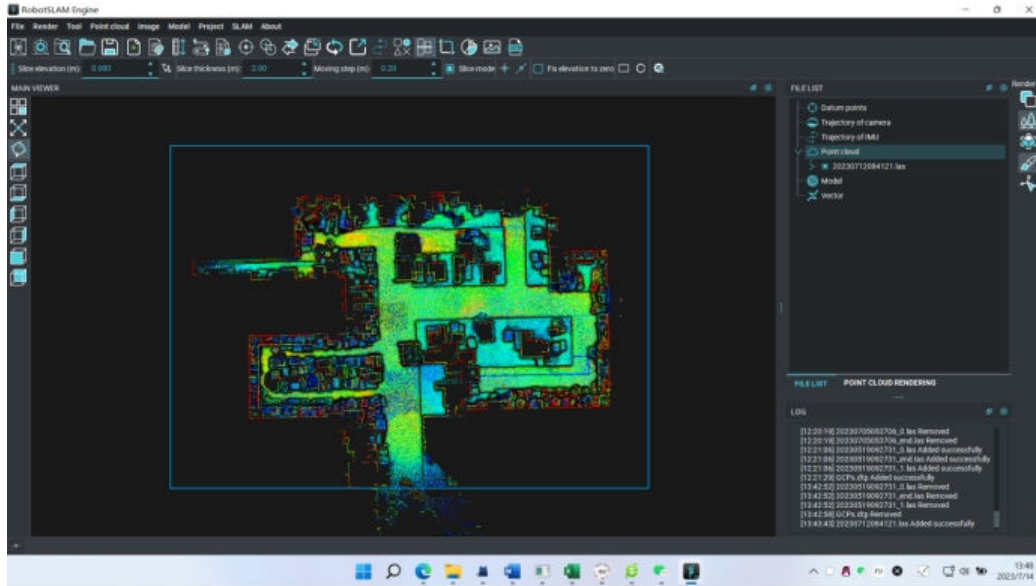
4.9 How to show the room inside when make a demo

1st, import point cloud

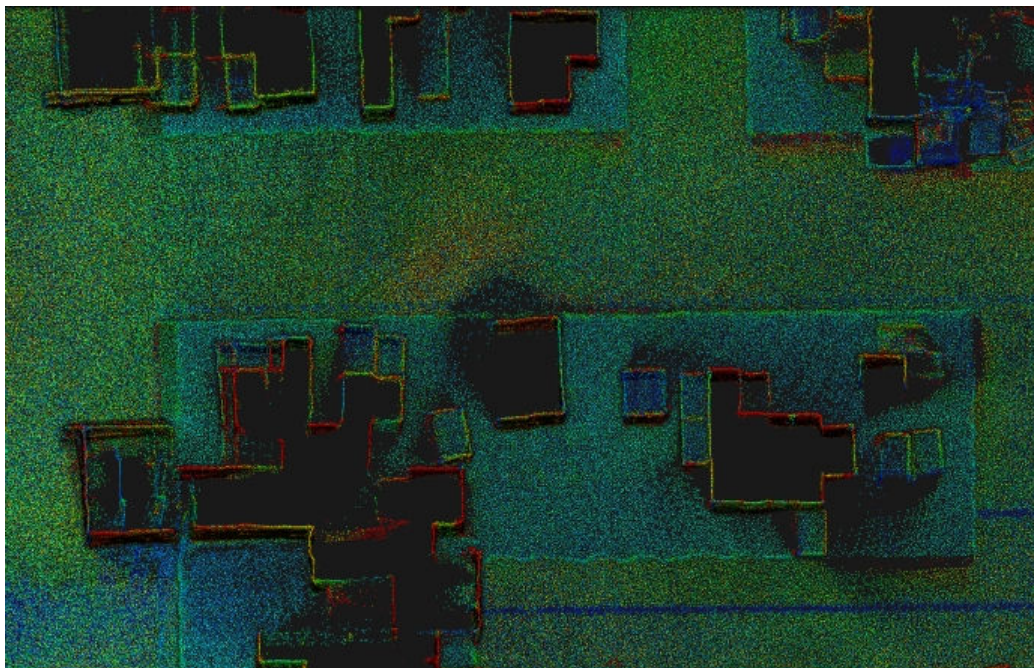
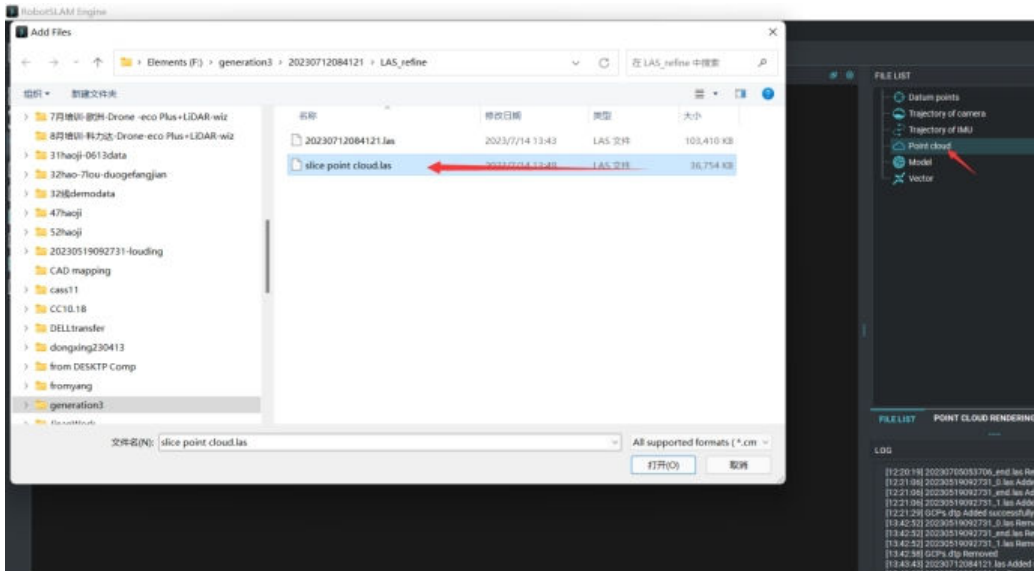


2nd, click "Browse Page, and do the following steps to save the point cloud in slice view:





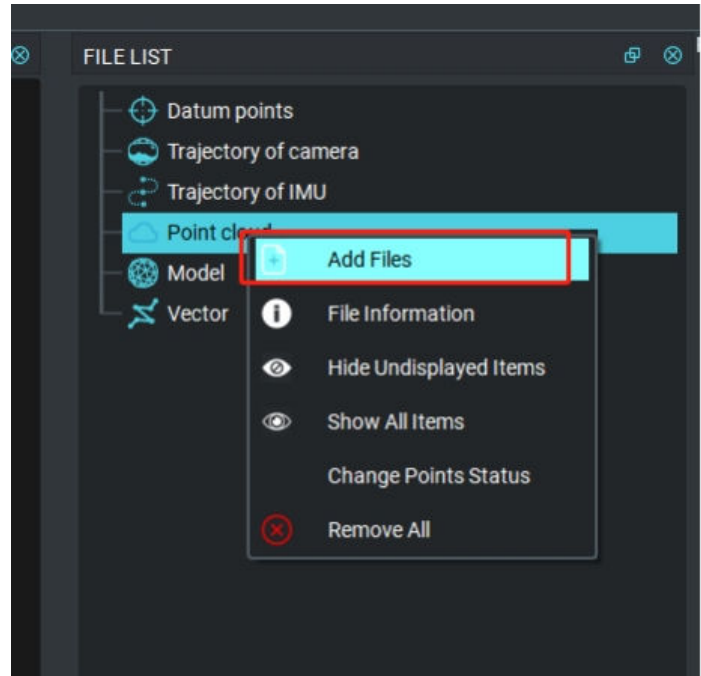
Right click” Point cloud” to import the saved point cloud after remove the roof



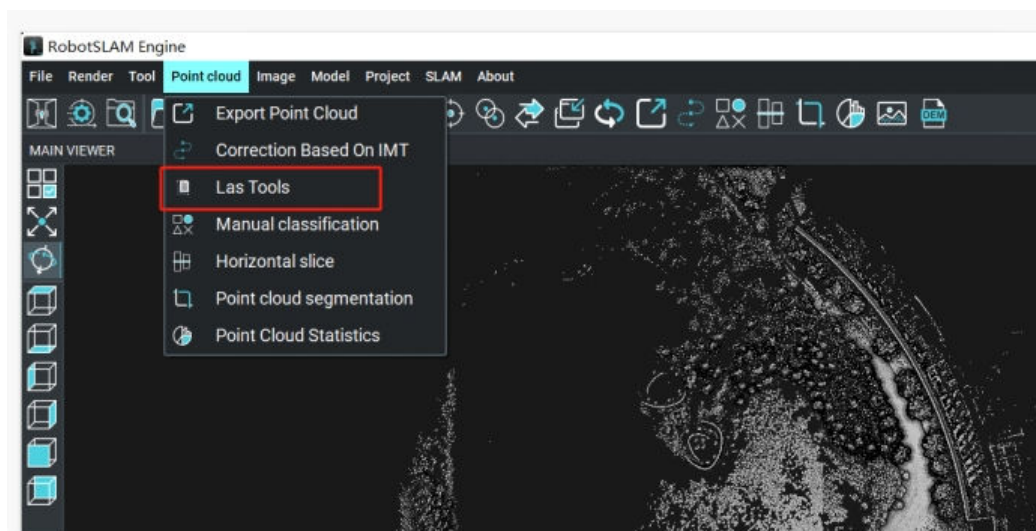
4.10 Ground extraction (Auto)

If the user needs to extract the ground point cloud, there is a function called Las Tools.

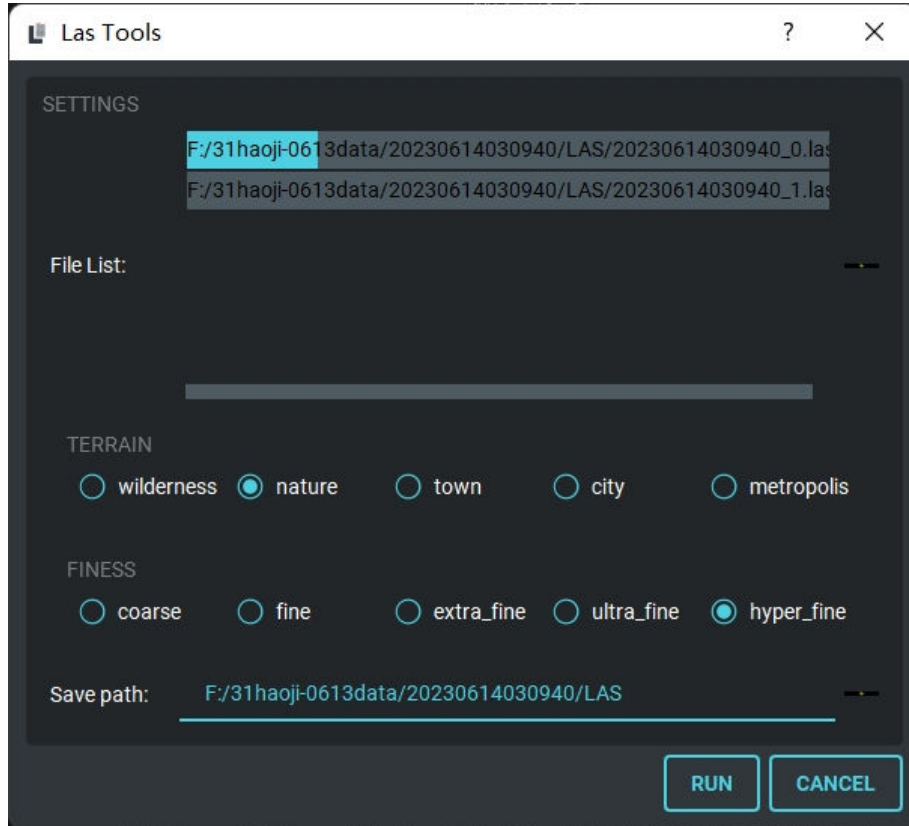
1st, import the point cloud(right click “Point cloud”,



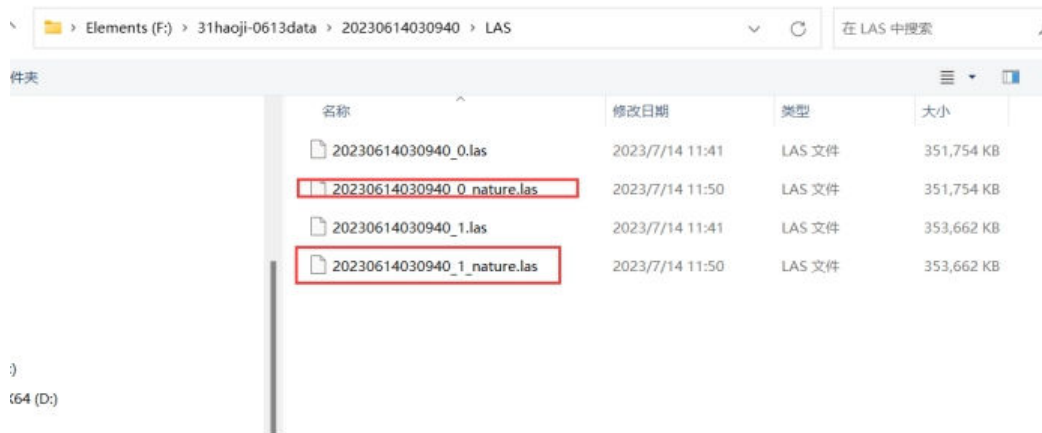
2nd, Point cloud/Las Tools,



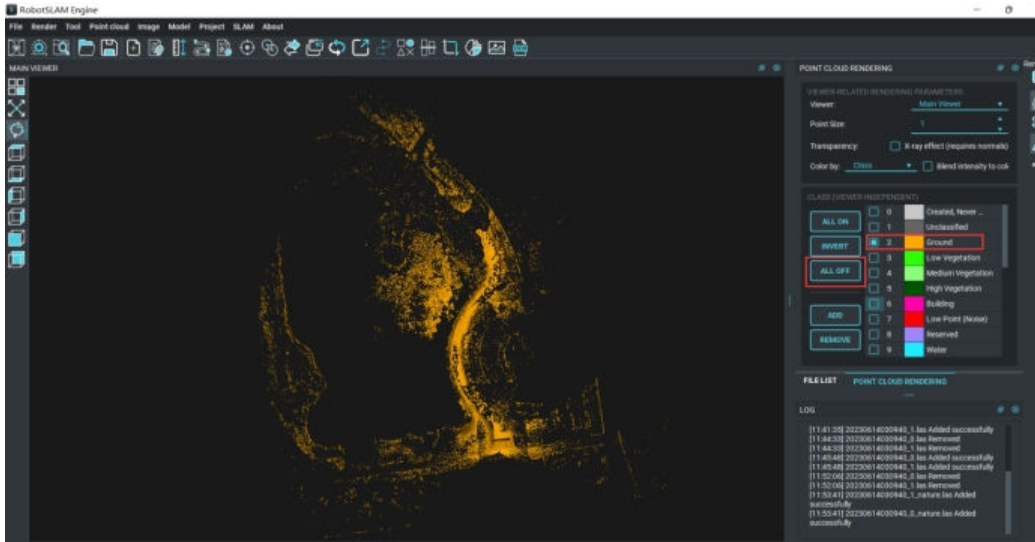
3rd: select terrain type and fine type, set Save Path, and then run.



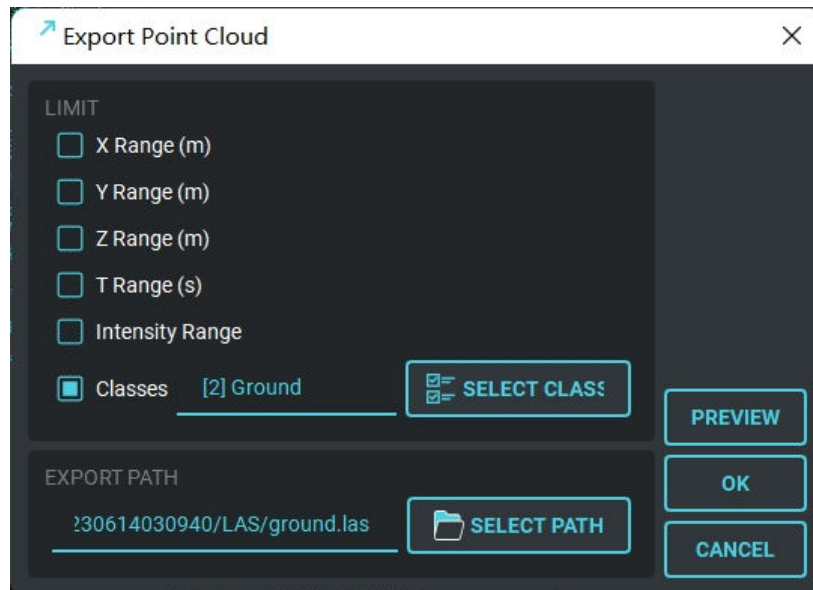
4th: load the las file saved for the previous step,



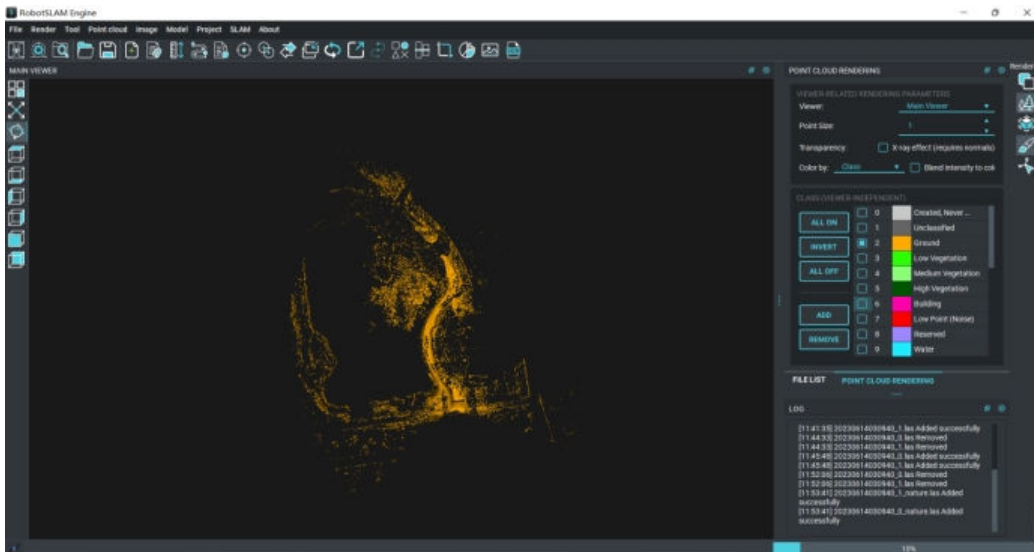
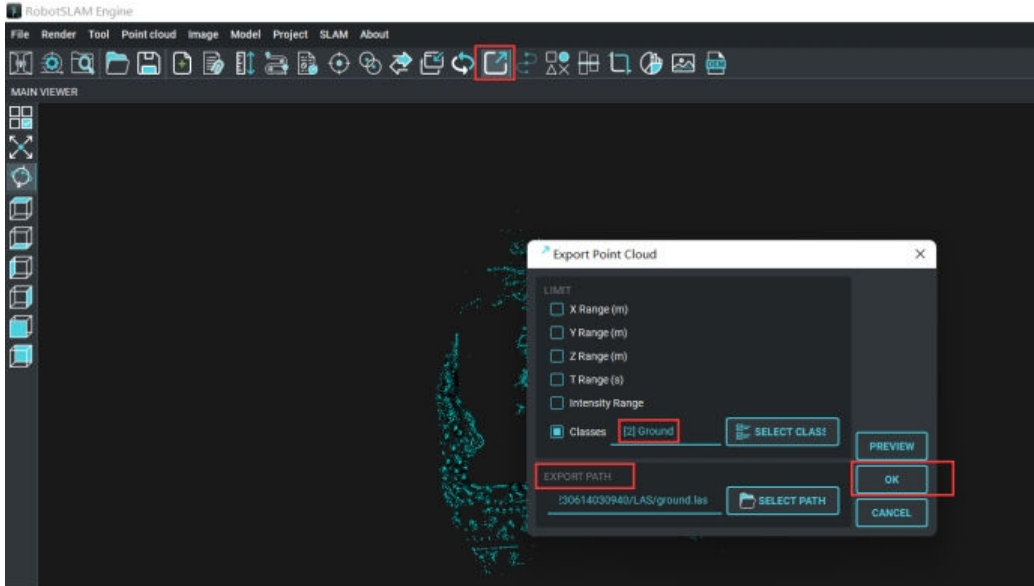
5th: check "ALL OFF", only display Ground to check it as below:



6th, export ground class.

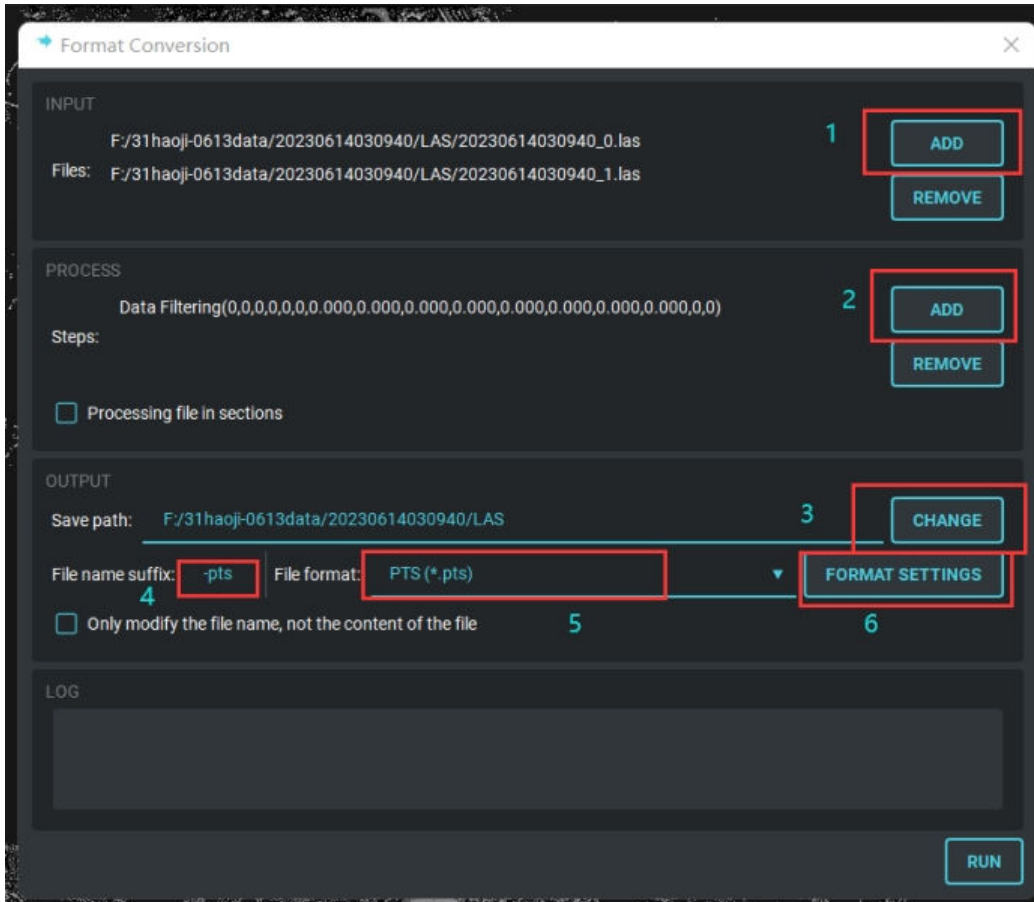


Export ground class



4.11 Format conversion

RobotSLAM export standard LAS format point cloud files, sometimes, the users may need other formats, txt, pts, xyz, or others. Here takes pts format conversion as an example:



1st, load the files;

2nd, add the method “data filtering”;

3rd, change the save path;

4th, add the file suffix;

5th, select the format PTS;

6th, do the format settings, click ok to get the pts format file.

Save Text File
✕

File type: Point cloud

FILE CONTENT

1	2	3	
X(m)/ Latitude(deg)/...	Y(m)/ Longitude(deg)/...	Z(m)/Height(m)/ Up(m)	
			<div style="display: flex; flex-direction: column; gap: 5px;"> <div style="border: 1px solid #ccc; padding: 2px 5px;">ADD</div> <div style="border: 1px solid #ccc; padding: 2px 5px;">DELETE</div> <div style="border: 1px solid #ccc; padding: 2px 5px;">CLEAR</div> </div>

Separator: Comma

Save the attribute names in the file header

OK

CANCEL

Format Conversion
✕

INPUT

F:/31haoji-0613data/20230614030940/LAS/20230614030940_0.las (5%)	ADD
Files: F:/31haoji-0613data/20230614030940/LAS/20230614030940_1.las (5%)	REMOVE

PROCESS

Data Filtering(0,0,0,0,0,0,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000)

Steps:

ADD

REMOVE

Processing file in sections

OUTPUT

Save path: F:/31haoji-0613data/20230614030940/LAS CHANGE

File name suffix: -pts | File format: PTS (*.pts) FORMAT SETTINGS

Only modify the file name, not the content of the file

LOG

[12:10:04] PTS Format settings is saved

RUN

Format Conversion
✕

INPUT

Files: F:/31haoji-0613data/20230614030940/LAS/20230614030940_0.las (100%) ADD

Files: F:/31haoji-0613data/20230614030940/LAS/20230614030940_1.las (100%) REMOVE

PROCESS

Steps: Data Filtering(0,0,0,0,0,0,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.0) ADD

REMOVE

Processing file in sections

OUTPUT

Save path: F:/31haoji-0613data/20230614030940/LAS CHANGE

File name suffix: -pts File format: PTS (*.pts) FORMAT SETTINGS

Only modify the file name, not the content of the file

LOG

```

[12:10:04] PTS Format settings is saved
[12:11:46] 20230614030940_1.las Conversion completed(65.1s)
[12:12:38] 20230614030940_0.las Conversion completed(117.3s)
                
```

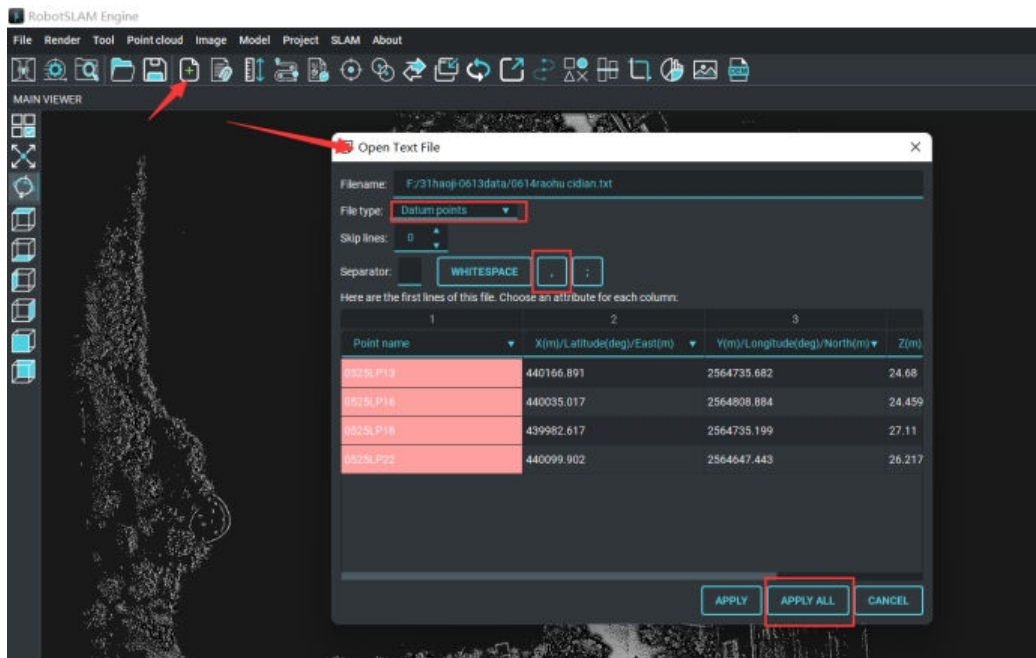
RUN

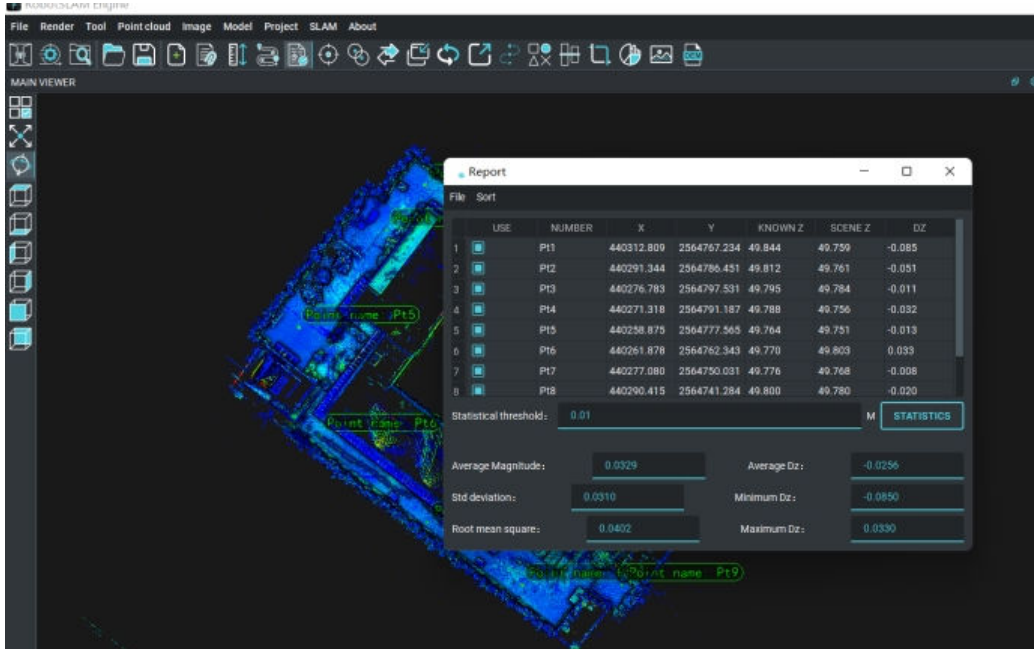
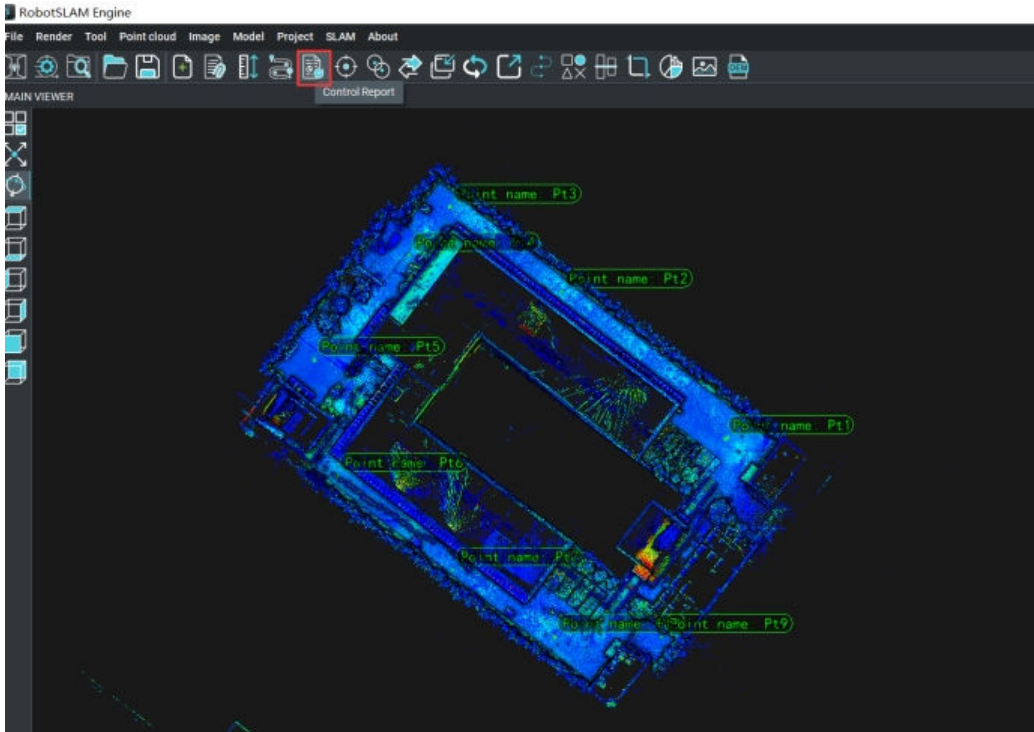
↑ « 31haoji-0613data » 20230614030940 » LAS 在 LAS 中搜索

名称	修改日期	类型	大小
20230614030940_0.las	2023/7/14 11:41	LAS 文件	351,754 KB
20230614030940_0_nature.las	2023/7/14 11:53	LAS 文件	351,755 KB
20230614030940_0-pts.pts	2023/7/14 12:12	PTS 文件	326,910 KB
20230614030940_1.las	2023/7/14 11:41	LAS 文件	353,662 KB
20230614030940_1_nature.las	2023/7/14 11:53	LAS 文件	353,663 KB
20230614030940_1-pts.pts	2023/7/14 12:11	PTS 文件	332,533 KB
ground.las	2023/7/14 11:57	LAS 文件	140,186 KB

4.12 Import checkpoint file and generate the vertical accuracy report

If the user already has some checkpoints before scanning, and when collect data, the RTK function works, and receive absolute coordinates. Please import the checkpoints coordinate file, and check the accuracy report by clicking “Control report”.

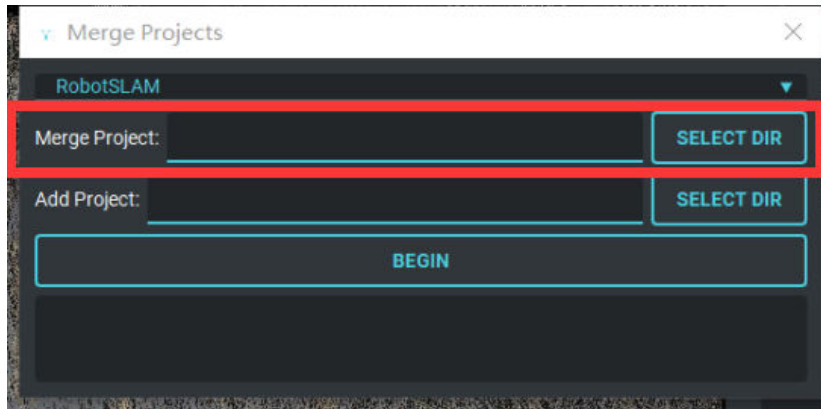




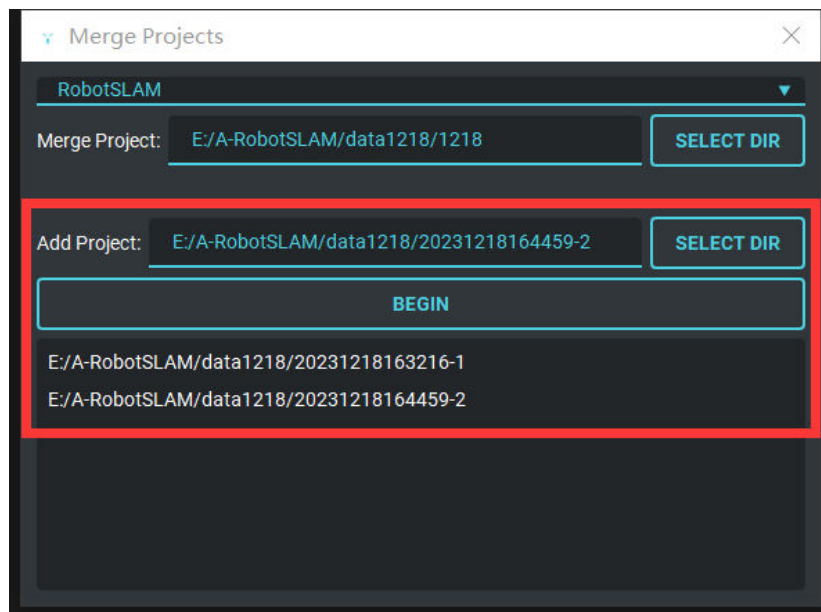
4.13 Merge SLAM project




In the case of large-area multiple collections, perform multiple stitching according to the overlapping areas.

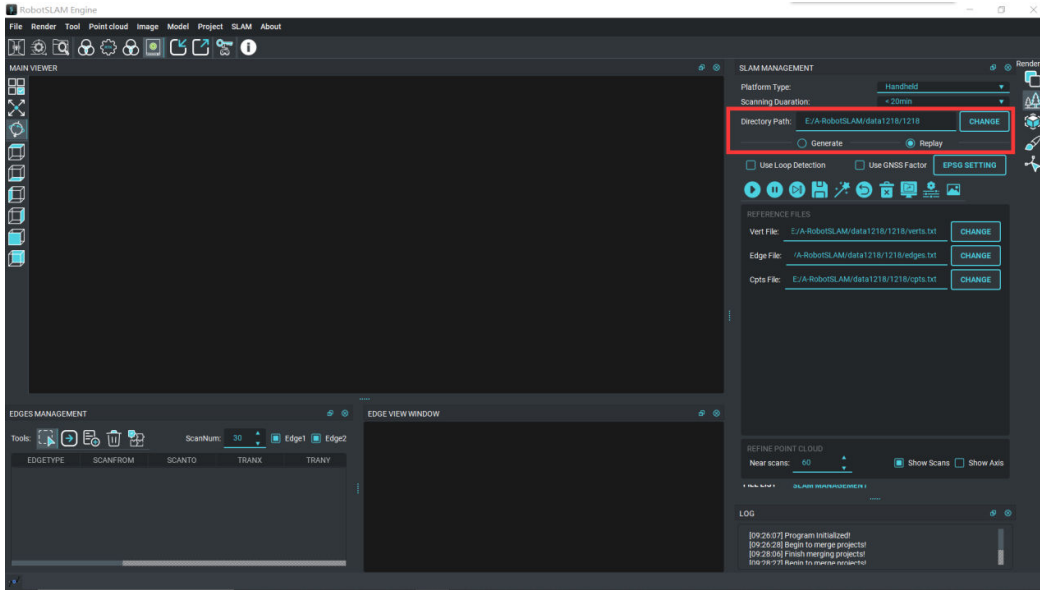
1. create a new folder, then open the A software.
2. select the new folder here in Merge Project.



3. select the folder you want to splice here one by one in Add Project and then choose to start.



4. Then click SLAM Manager  , open the new folder, click on the point cloud **Replay**, then find the loop frame match, and click optimize  after the match is completed, Finally go to  save the track.

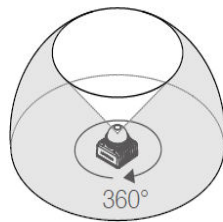


5.Usage Guidelines

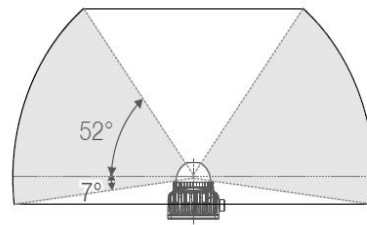
This chapter will talk about guidelines for how to use RobotSLAM Lite to receive desirable surveying results.

As we know, SLAM can work both indoors and outdoors, and don't rely on the satellite signals to do the scanning and get 3D point cloud. But it doesn't mean we can scan randomly to get the results. And there are some rules need to take care.

5.1 Laser Scanning Coverage



Horizontal



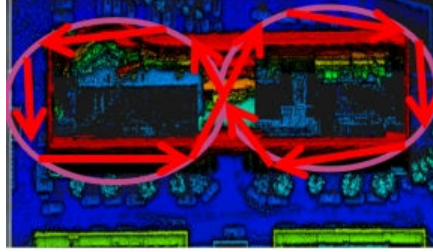
Vertical

5.2 Walking speed

1. The scanning speed is normally walking speed;
2. Don't shake the device violently during the process. When turning, turn around slowly, especially for indoor environment or stairs scanning.

5.3 Loop closure

It is necessary that the operator should start scanning and end scanning in the same position to close the loop. Because there are cumulative errors in the SLAM scanning, and the loop works well to eliminate the error.



Outdoor small scene route planning



Outdoor large scene route planning

5.4 Indoor scanning

1. For indoor environment scanning, please open all doors in advance;
2. Plan walking route in advance;
3. Avoid walking people as much as possible;



Open the door before start scanning