FJDynamics

# Getting the Most Out of Your FJD Trion S2

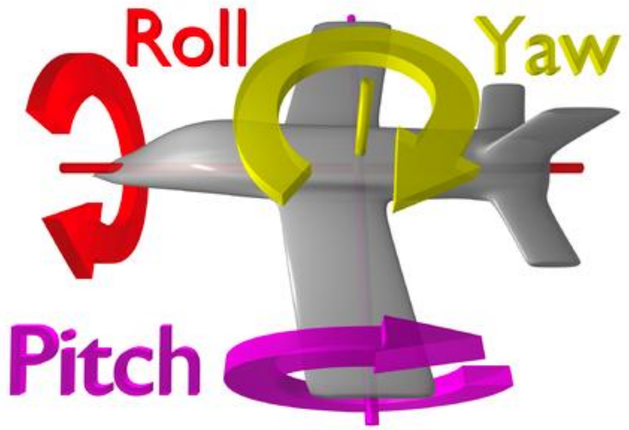
## Product Training

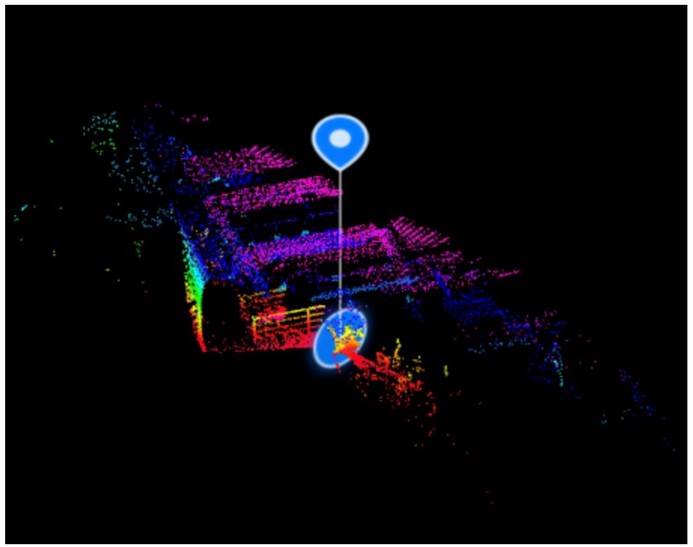
# Agenda

1. Introduction
2. Getting started
3. Connecting S2 to FJD Trion Scan
4. How to optimize scanning results when working with S2
5. FAQs

# Introduction

# The technology behind S2



## LiDAR - light detection and ranging

AKA “laser scanning” or “3D scanning.”

The technology uses eye-safe laser beams to create a 3D representation of the surveyed environment.

## IMU - Inertial measurement unit

Combines information from multiple sensors to provide information about the orientation, acceleration, and sometimes angular velocity.

Improves system precision.

## SLAM

Simultaneous localization and mapping.

The scanner “knows” where it is and “understands” its surroundings as it maps the environment

# The technology behind S2


## RTK - Real-Time Kinematic

A high-precision satellite positioning technique that uses real-time corrections from a reference station to achieve centimeter-level accuracy.

Improves system accuracy and stability for outdoor scenarios.

## VIO - Visual-Inertial Odometry

A real-time navigation technology that fuses visual data from cameras and motion measurements from an inertial measurement unit (IMU) to estimate a device's position, orientation, and movement in environments where GPS signals are unavailable or unreliable.

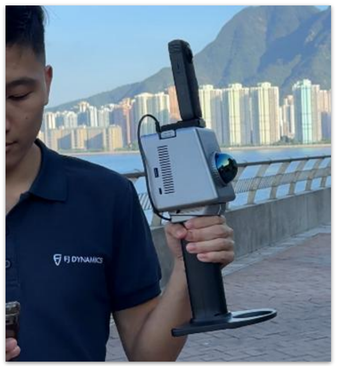
# How SLAM Works

- **Initialization:** SLAM starts with an initial estimate of the device's position and gradually refines this estimate as it moves through the environment.
- **Feature Tracking:** The system tracks features (landmarks) in the environment using sensor data.
- **Map Update:** As the device moves, it updates the map with new observations and refines existing features.
- **Loop Closure Detection:** Recognizes previously visited locations, correcting accumulated errors and enhancing the overall accuracy of the map.

# LiDAR Scanner Solutions

TLS

Mobile



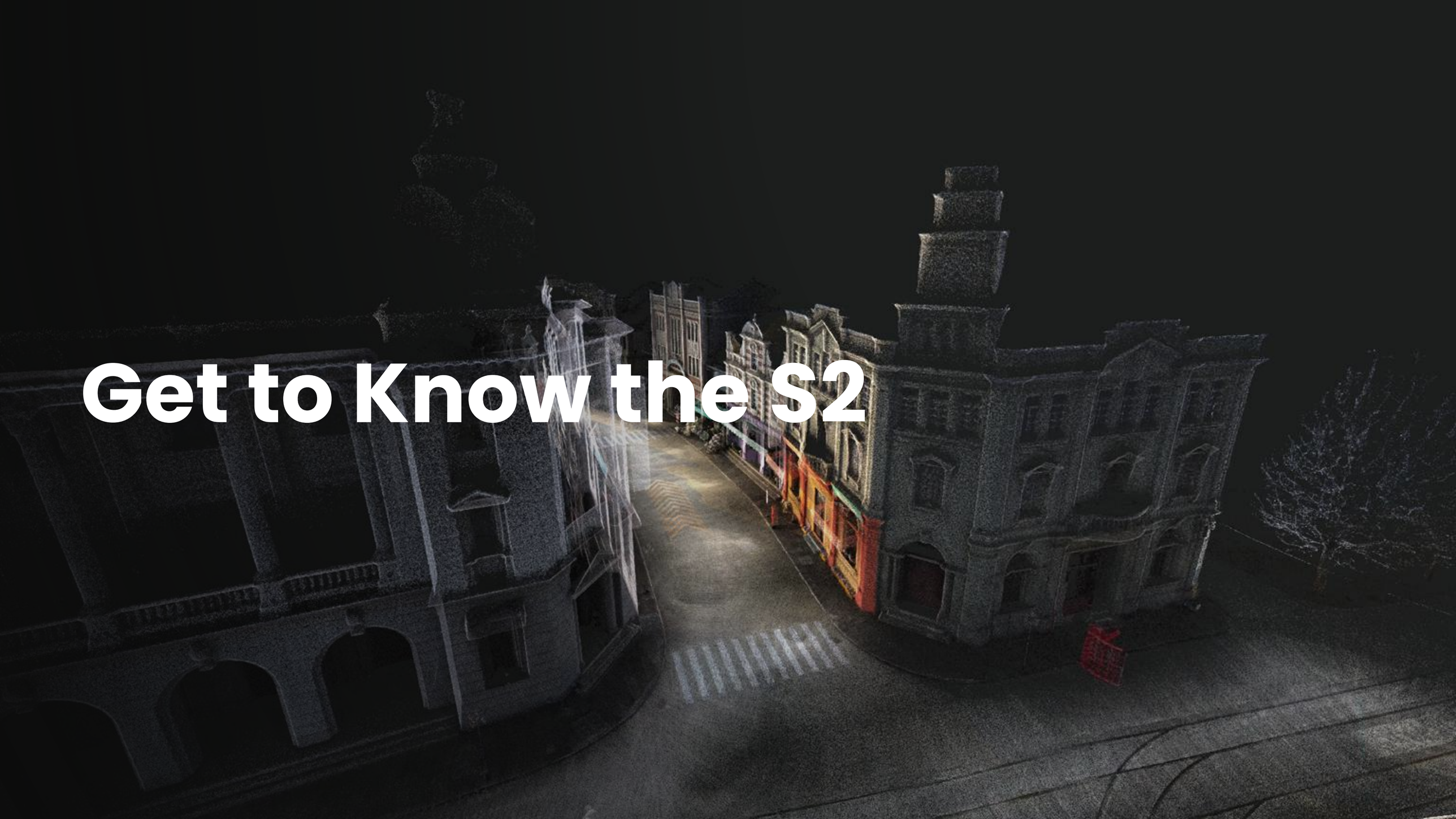
Handheld

Aerial

Robot dog

RTK

Car-mounted



# Get to Know the S2


FJDTrion™ S2 LiDAR Scanner
Smaller Size, Larger Capability

# Key Features

1.2cm
Accuracy

Real-time
Colorization

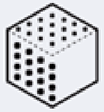
Multi-SLAM
Algorithms

Georeferenced
PointCloud

Multi-Scenario
Adaptation

Indoor & Outdoor
Scanning

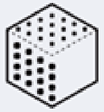
## S2



**320,000**
Points per second

**120m**
Range

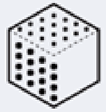
## S2 PRO



**640,000**
Points per second

**120m**
Range

## S2 MAX



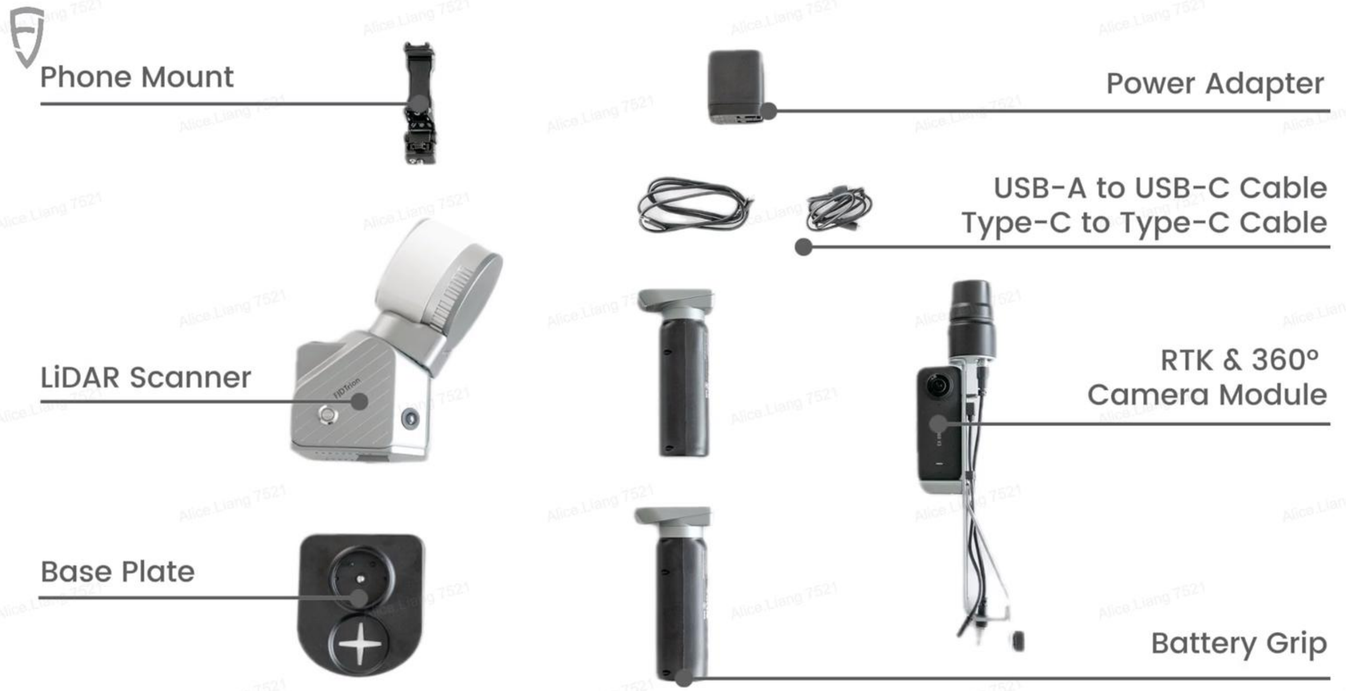
**640,000**
Points per second

**300m**
Range

# Key Specs

| | |
|---|---|
| **Relative Accuracy** | 1.2cm |
| **Scanning Range** | 120m/300m |
| **Weight** | 1.8kg |
| **LiDAR FOV** | 360° × 270° |
| **Points Per Second** | 320,000/640,000 |
| **Real-time Point Cloud** | Yes |
| **Colorized Point Cloud** | Yes |
| **RTK-assisted Mapping** | Yes |
| **VIO** | Yes |
| **built-in camera resolution** | 2*12MP |

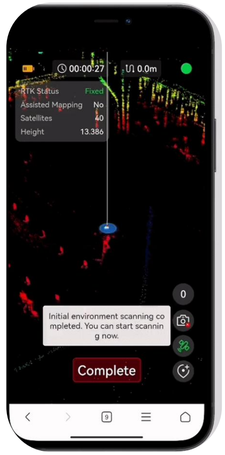
# In the Box


1. Product Documentation* 1 set
2. Target Sheet * 1 set
3. LiDAR Scanner* 1
4. RTK & 360° Camera Module * 1
5. Base Plate*1
6. Battery*2
7. Charger*1
8. Cables

# Workflow Overview

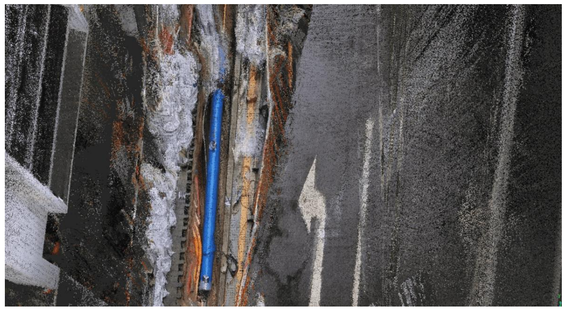
FJD Trion S2



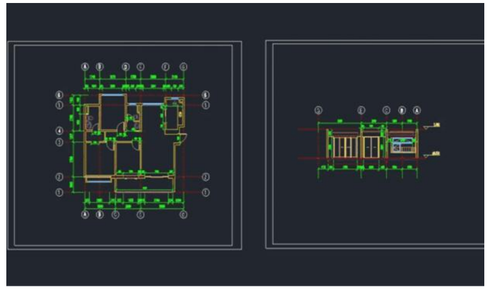

FJD Trion Scan

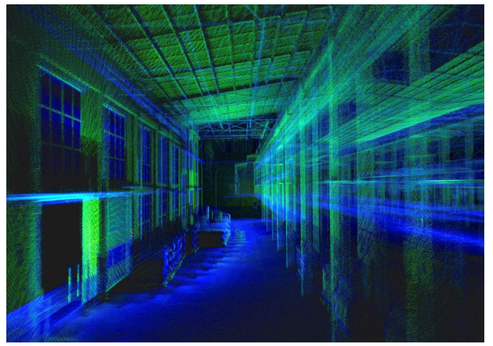
**Capture data**


FJD Trion Model



**Process data**





**Deliver Results**

# Getting Started

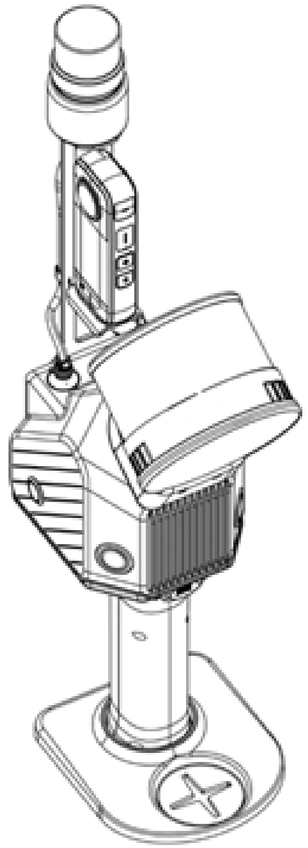
# Connecting the Camera and RTK

1. Install battery, RTK and 360° camera (optional)


2. Connect RTK and 360° camera cable accordingly

3. Turn on 360° camera and short press the power-on button

# Power button



Turn on/off: The button flashes green

Wi-Fi-STA Standby: The button solid green

Wi-Fi-AP Standby: The button solid blue

Scan initialization or save: The button flashes blue

Start scanning: The button flashes red

Device exception: The button flashes yellow

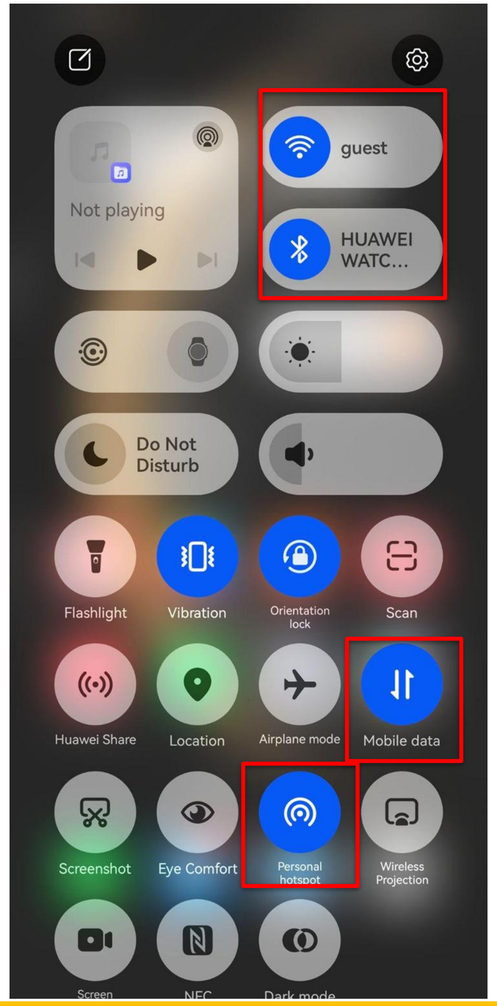
# FJD Trion Scan App

The FJD Trion Scan app is a hub for managing your scanners, project files, and point cloud data.

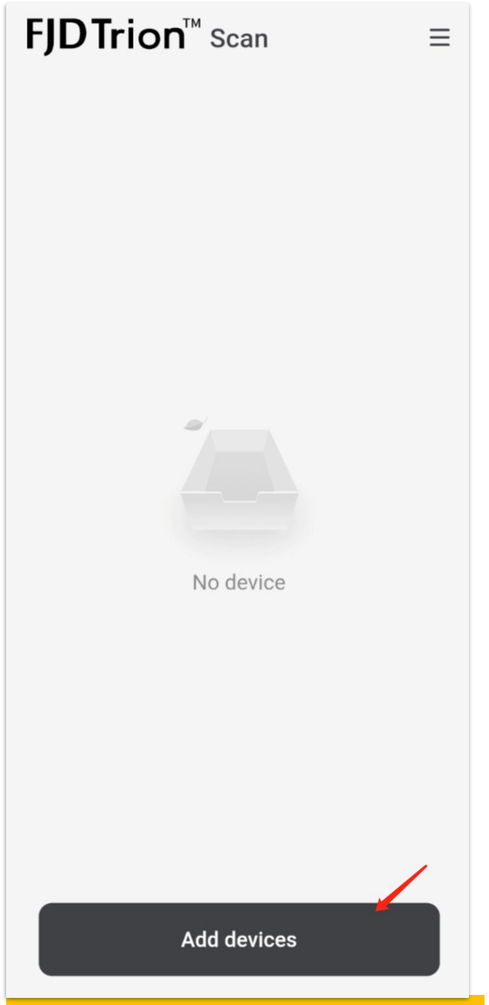
GET IT ON Google Play

Download on the App Store

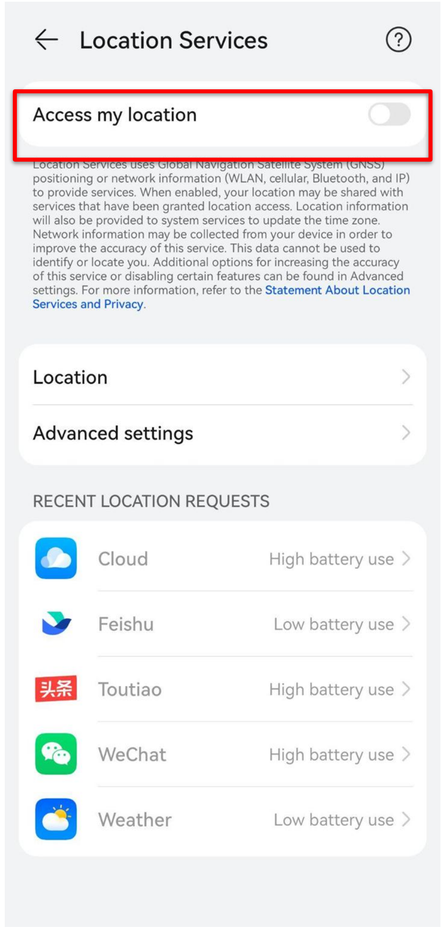
# Connect your scanner



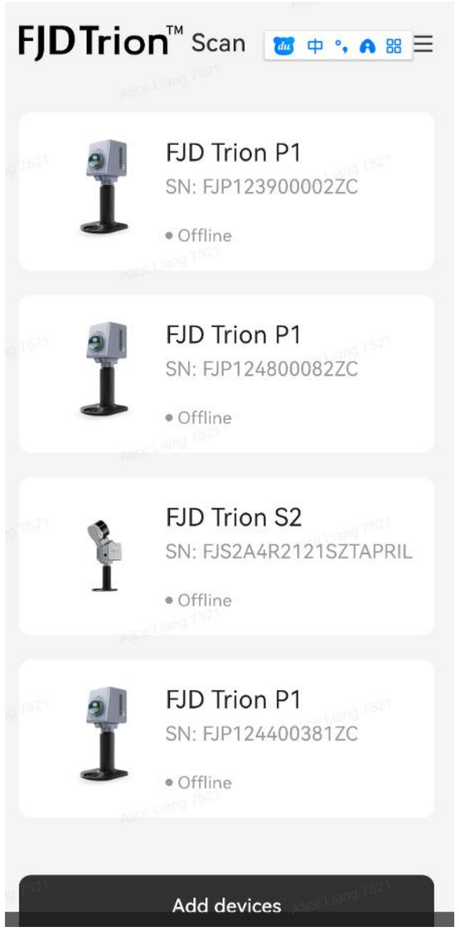

1. Open mobile phone's WIFI, bluetooth, hotspot and mobile data




2. Open the FJD Trion Scan App



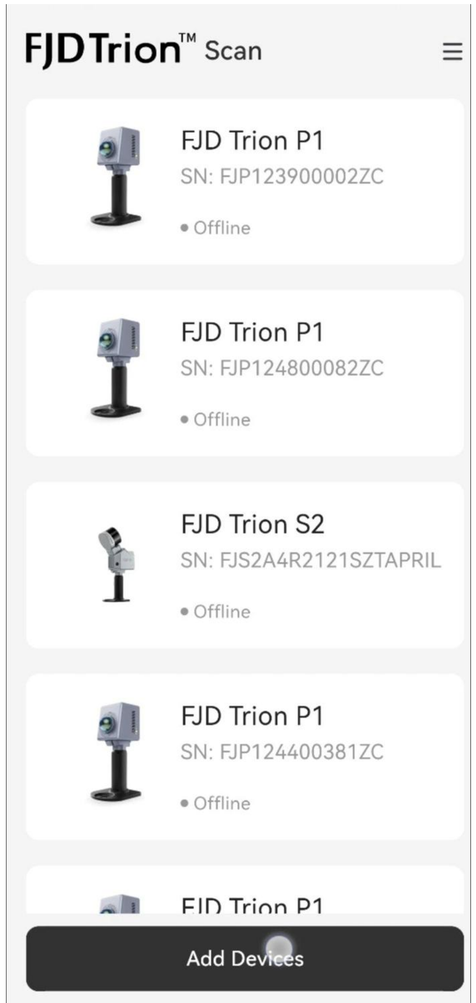

3. Grant location permissions

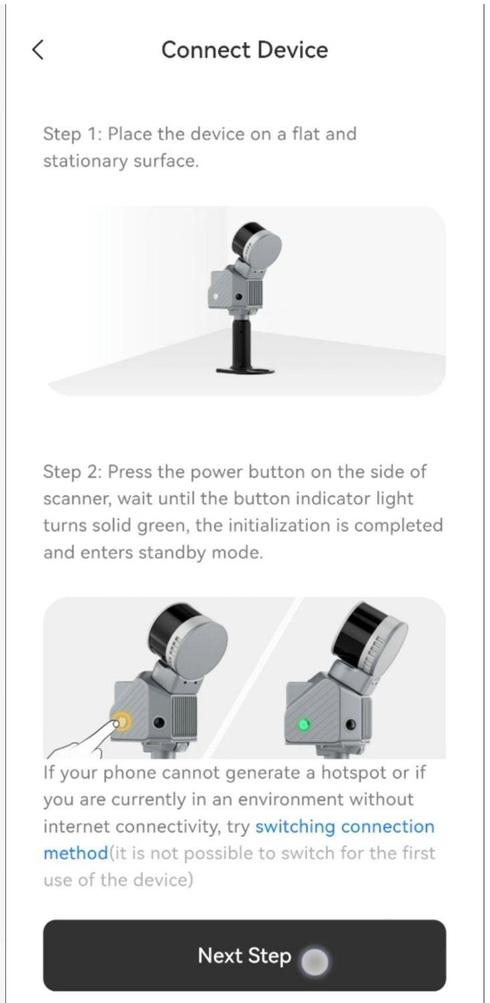


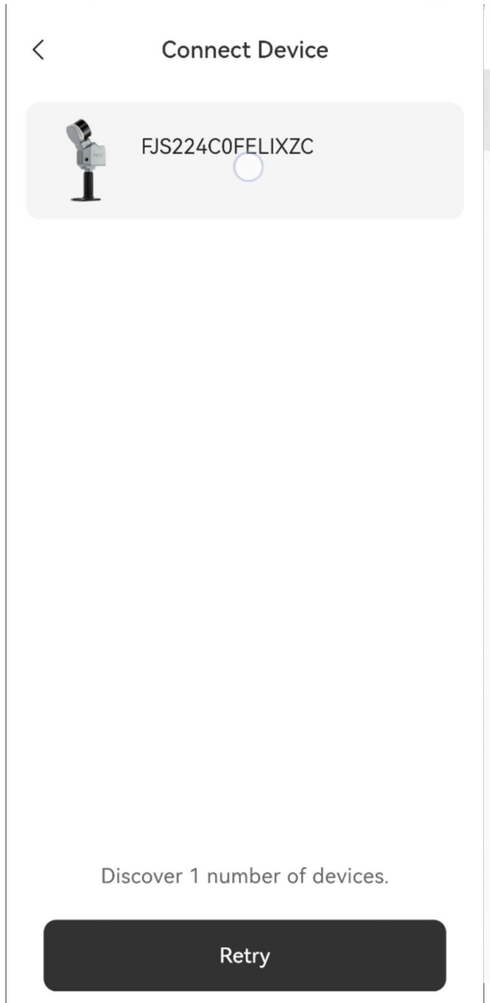


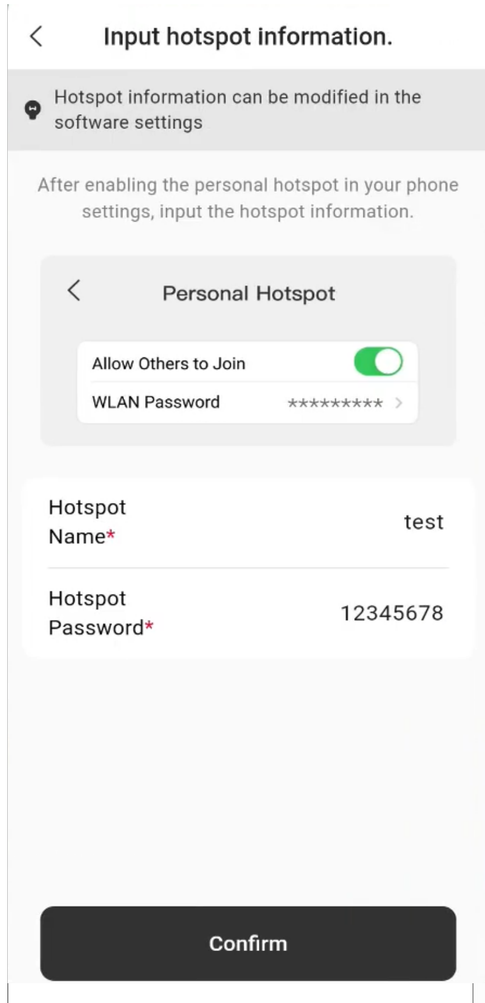
4. choose the device connected before or add devices

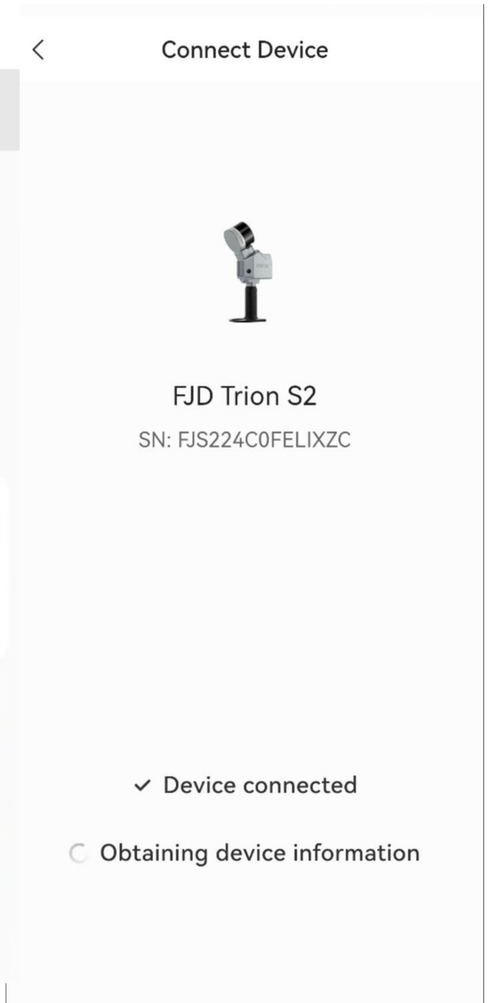
# Connect your scanner via hotspot(default)



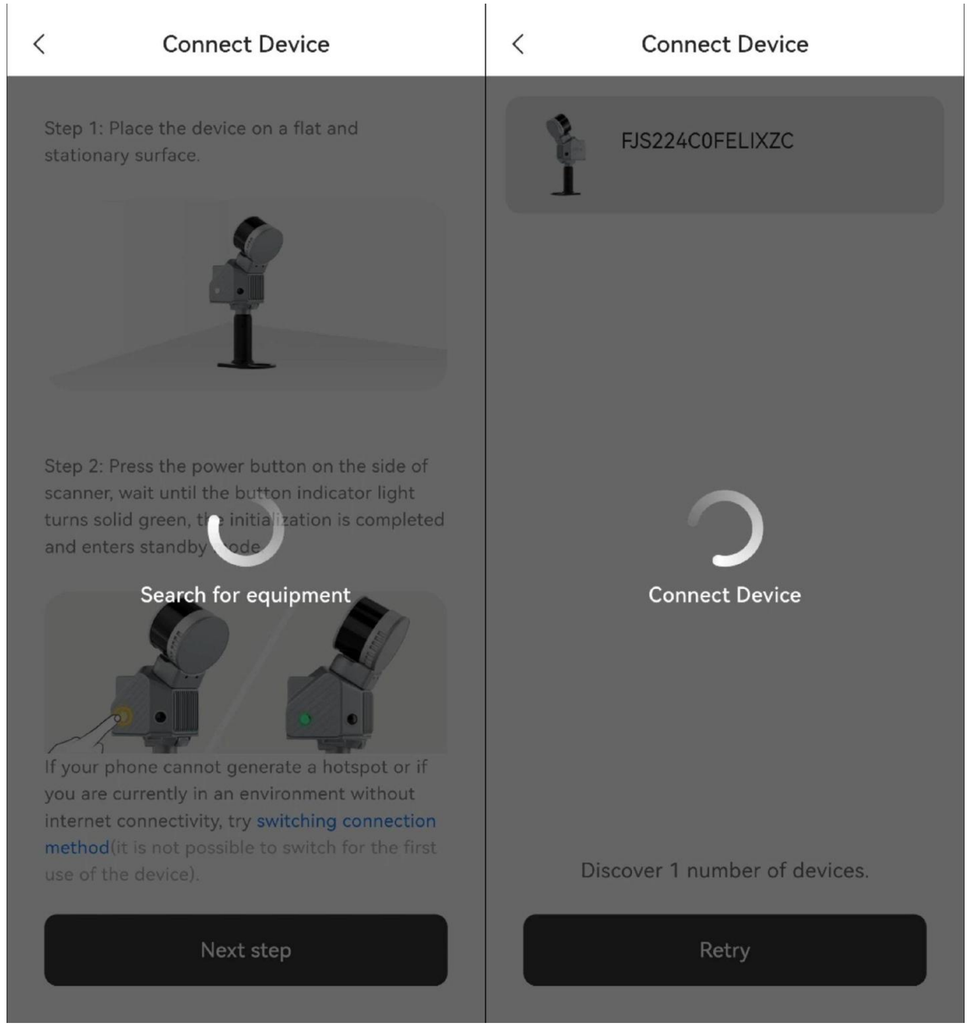



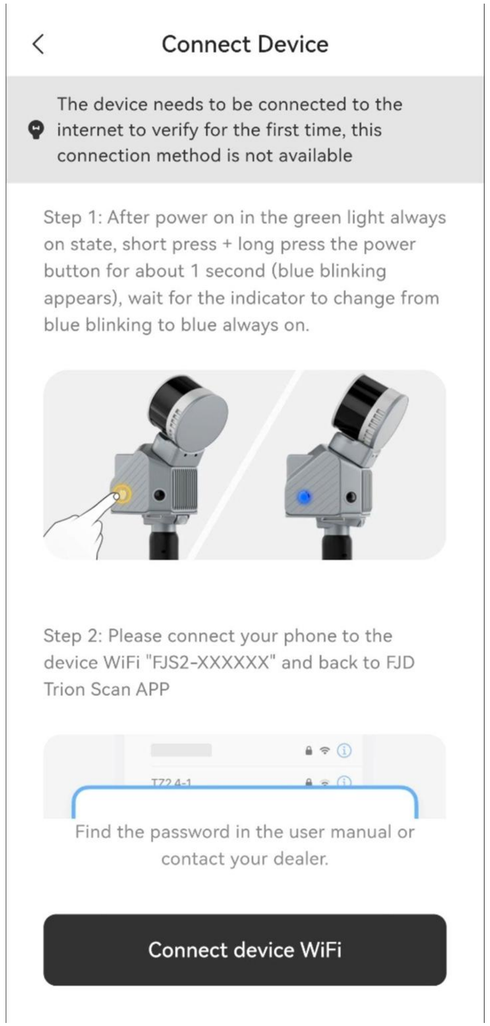

Personal hotspot account and password will be required to enter at first time

# Connect your scanner via WiFi







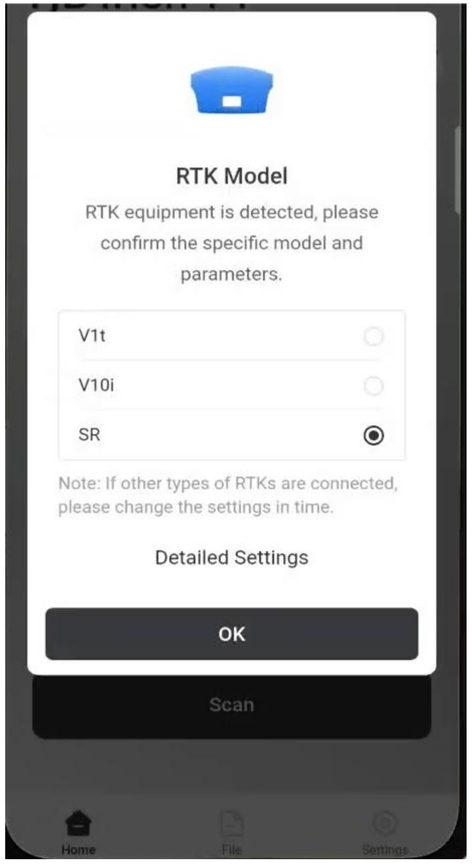


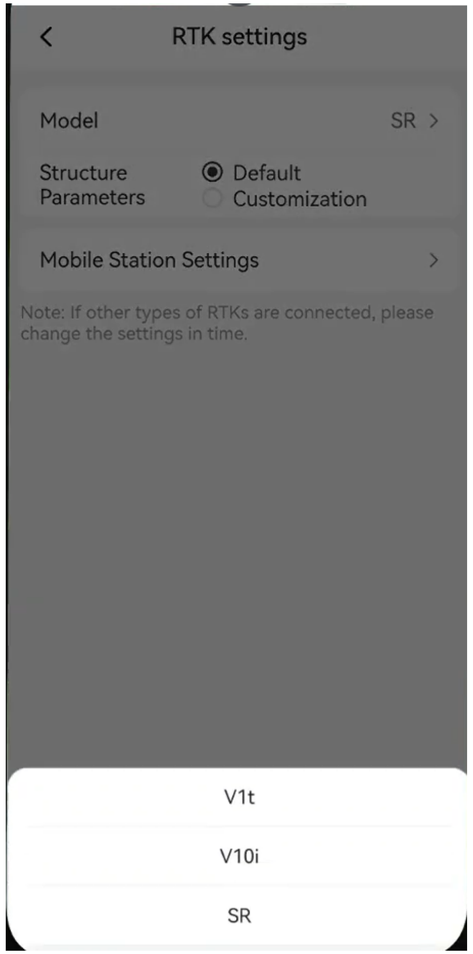


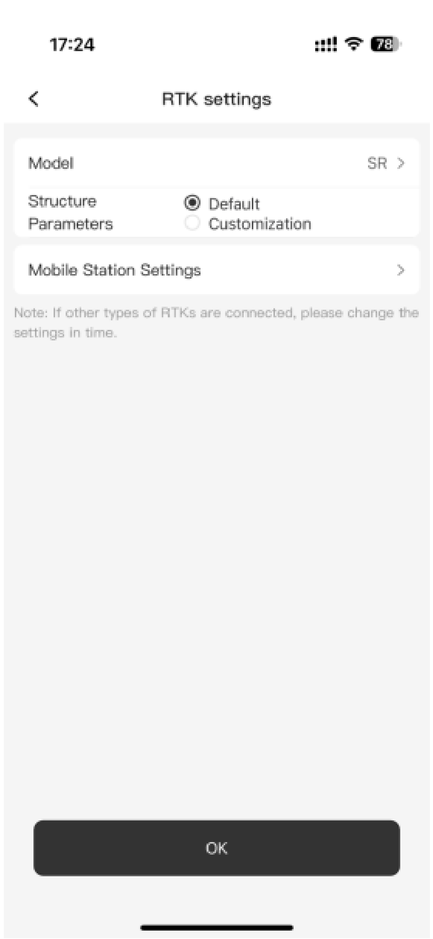

Search for the device and connect

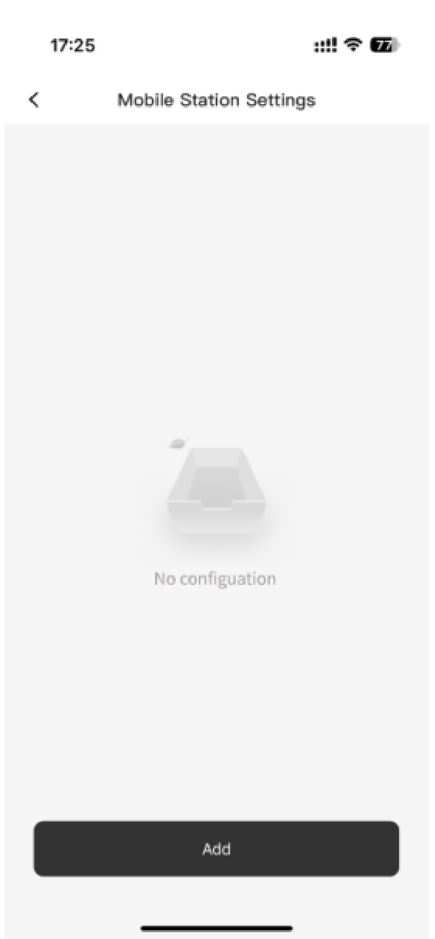
Short press+long press to change to wifi mode, enter Wifi password：fjdtrions2

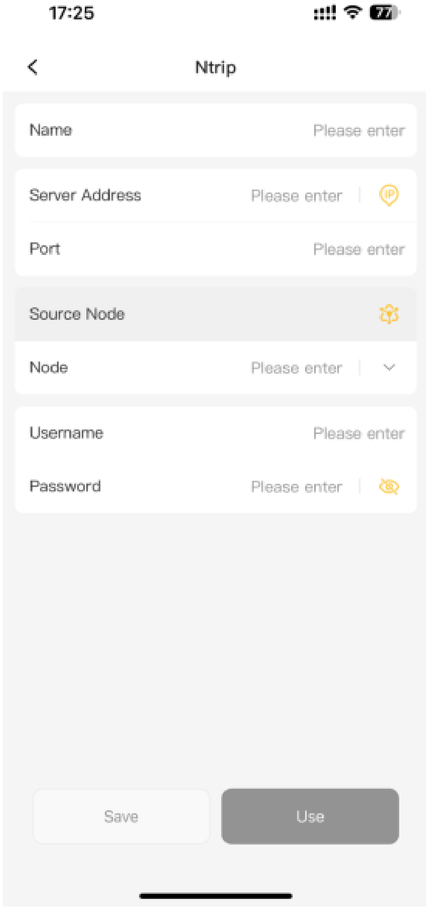
# RTK settings



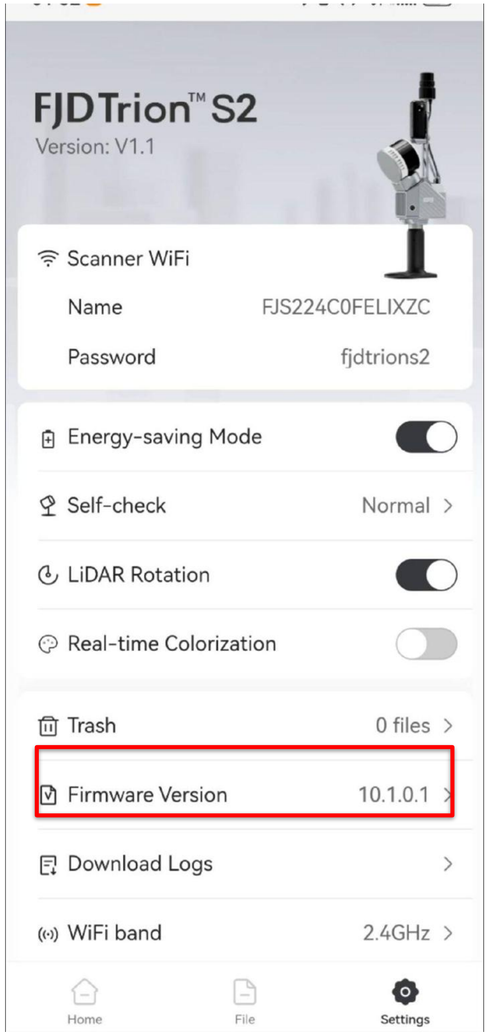



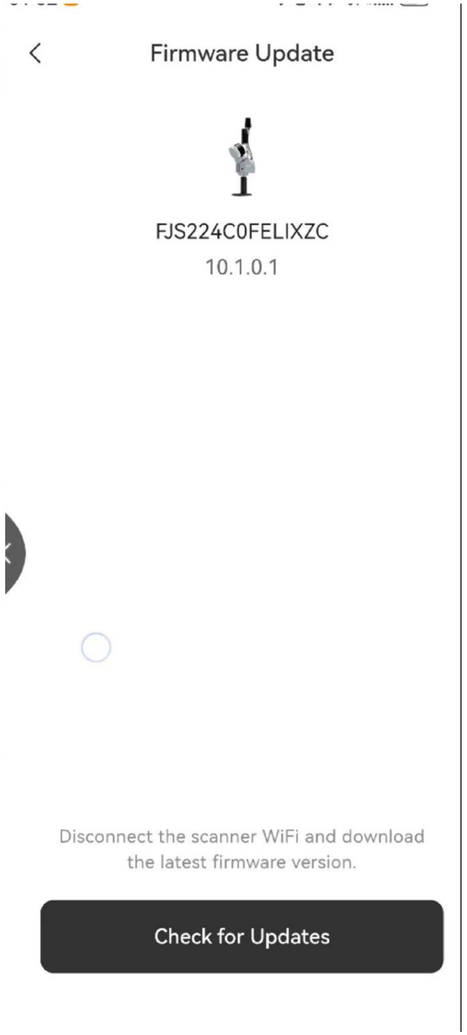




Select the right model and add mobile station info at the first time

Enter CORS Username and Password

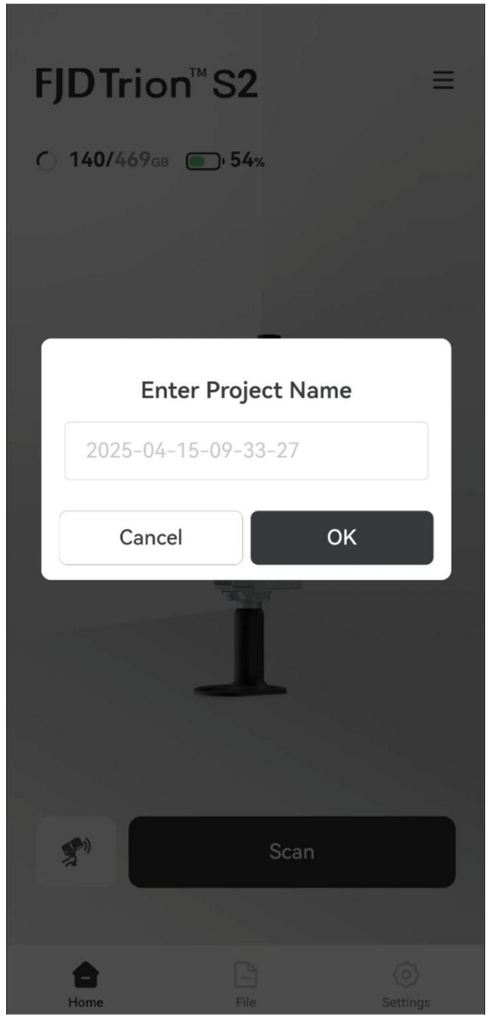
# Update the firmware



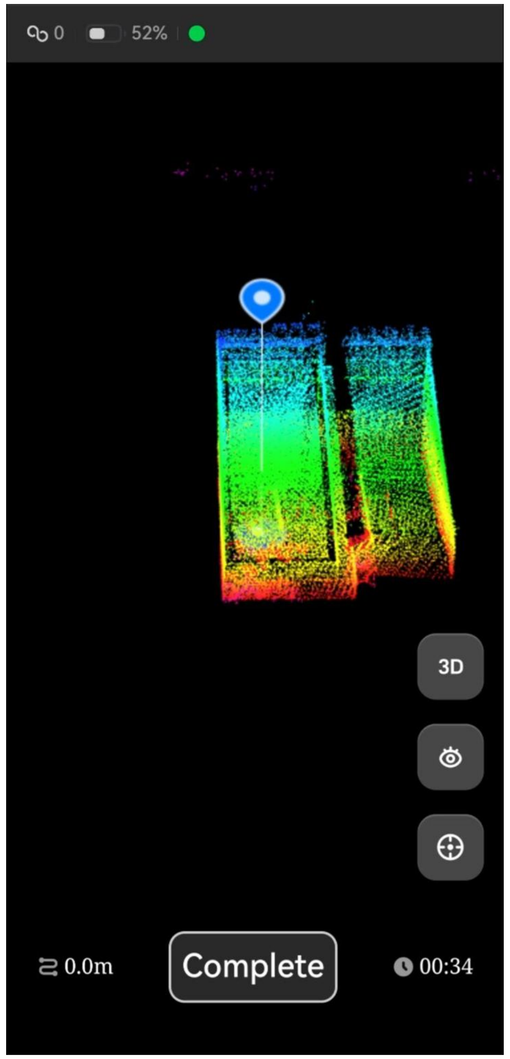



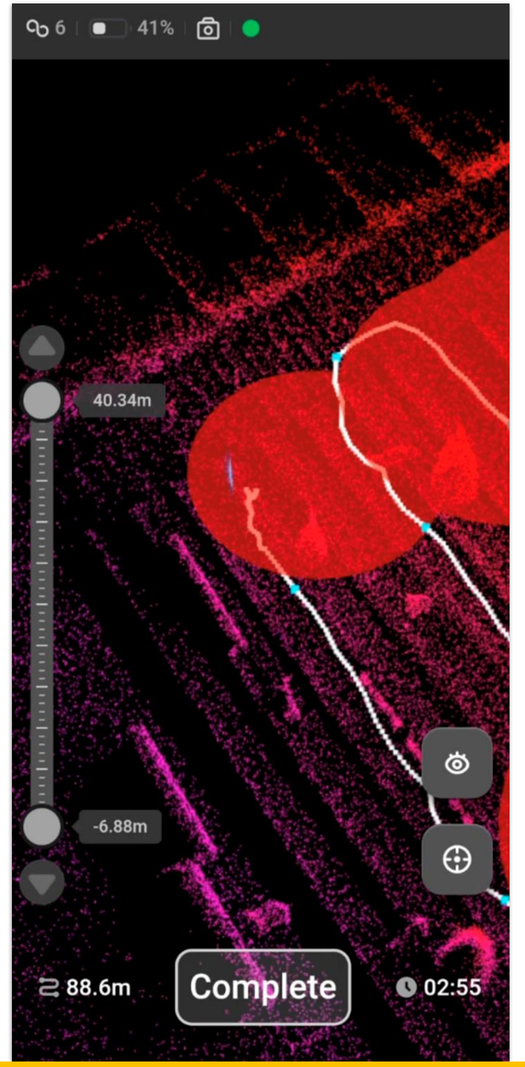

Go to Settings - Firmware Version - Check for Updates to install the latest update

# Begin scanning

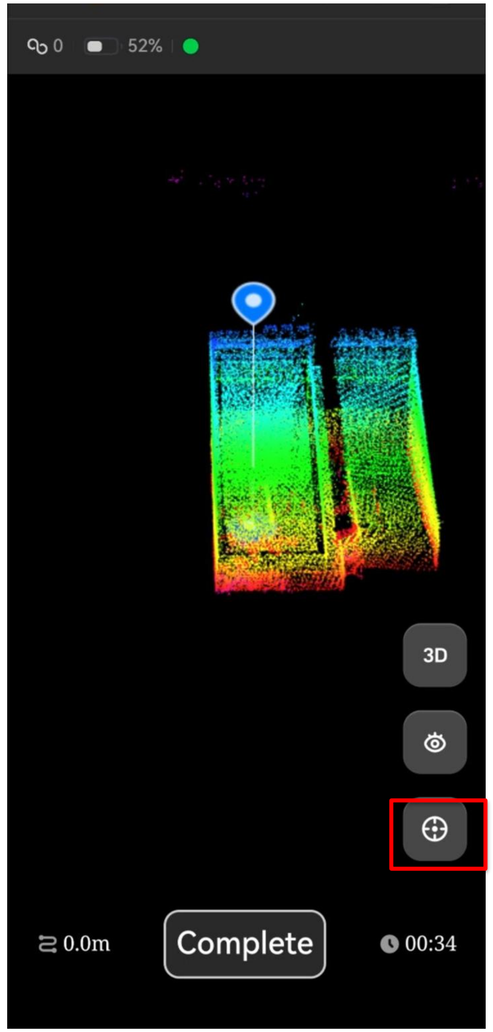


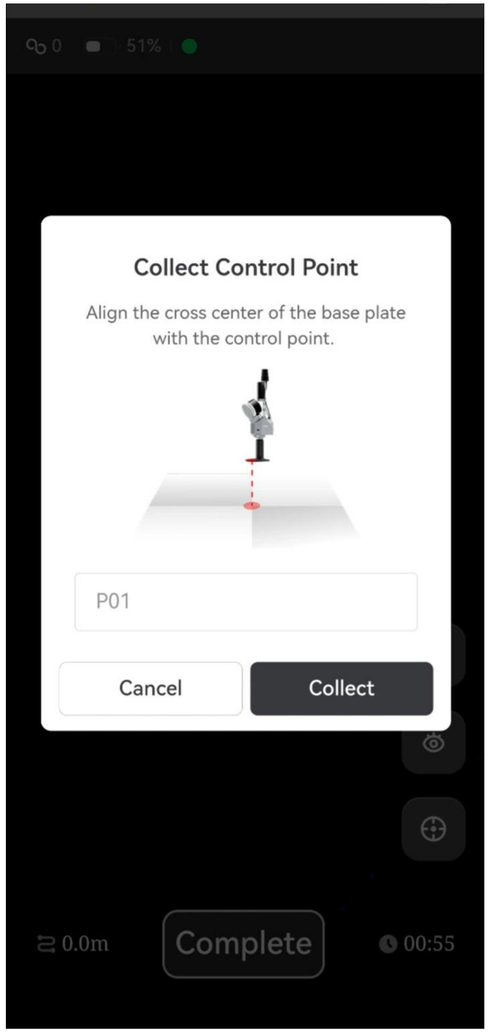


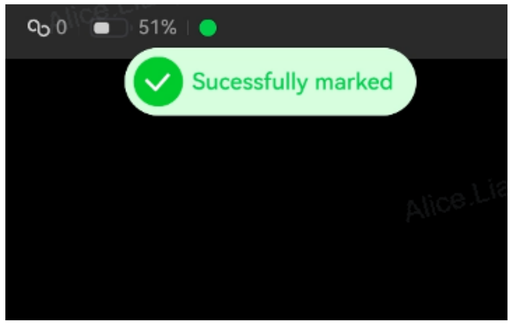




Check loop closure, battery and camera status in real-time.

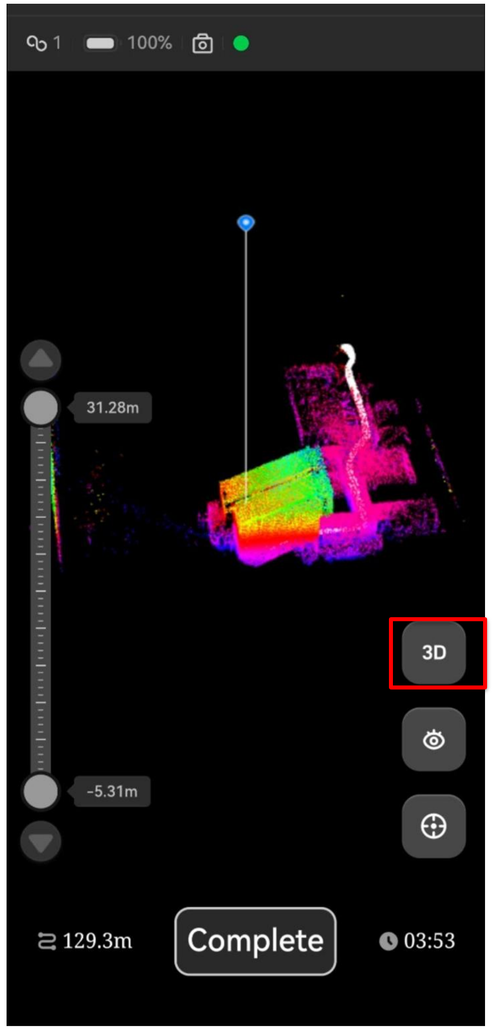
# Control points collection



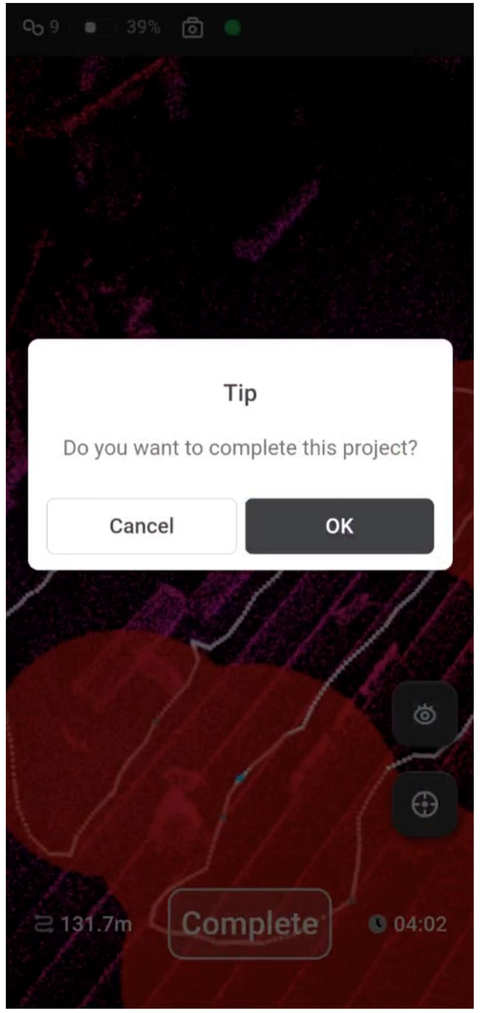



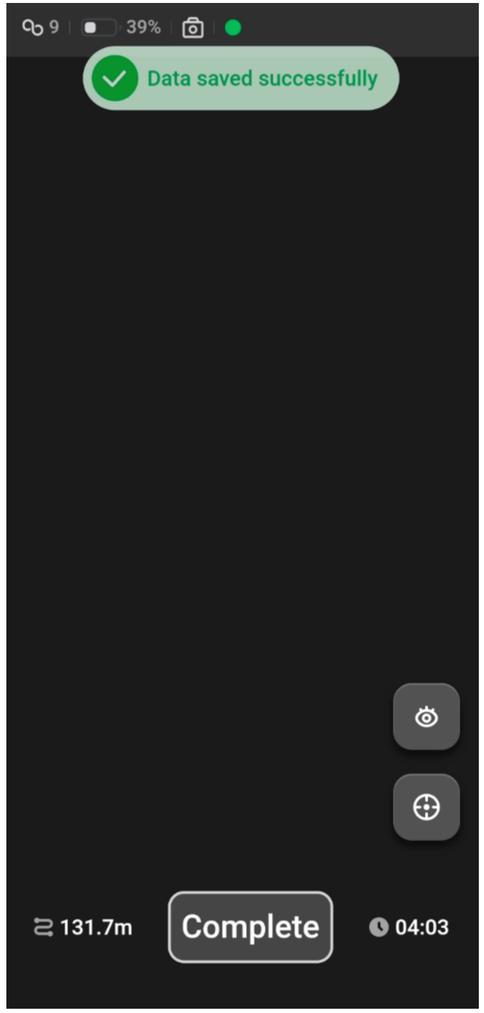
# 3D/2D view change

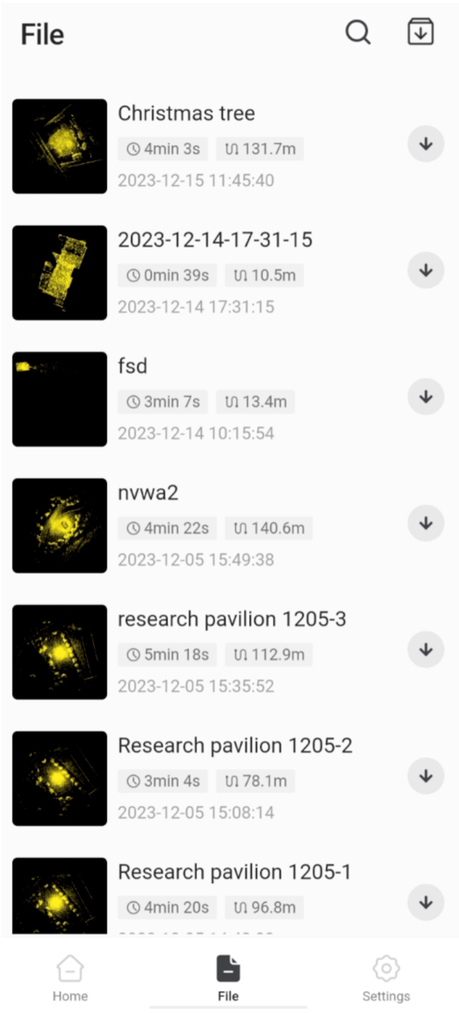


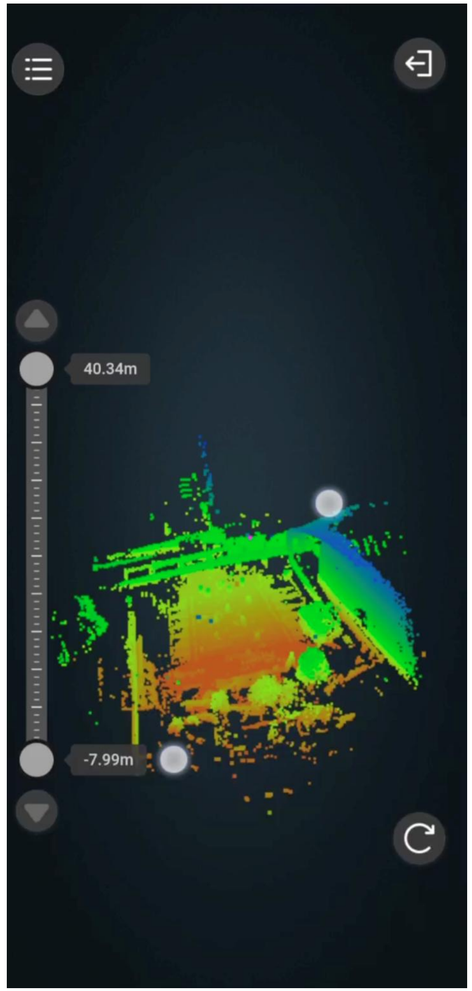

# Save and view results



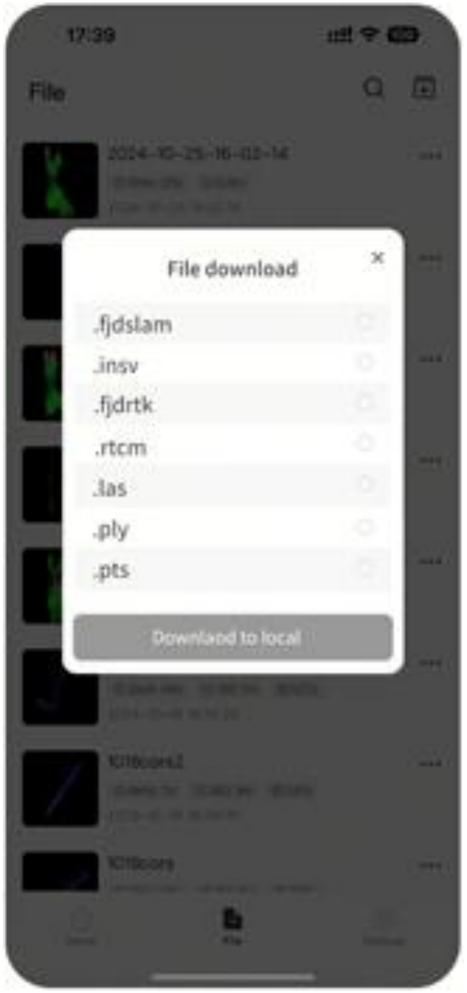


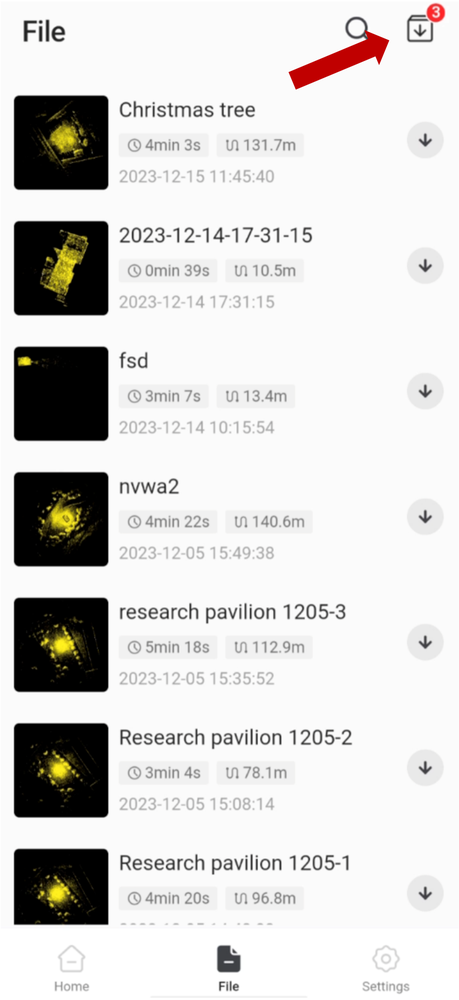


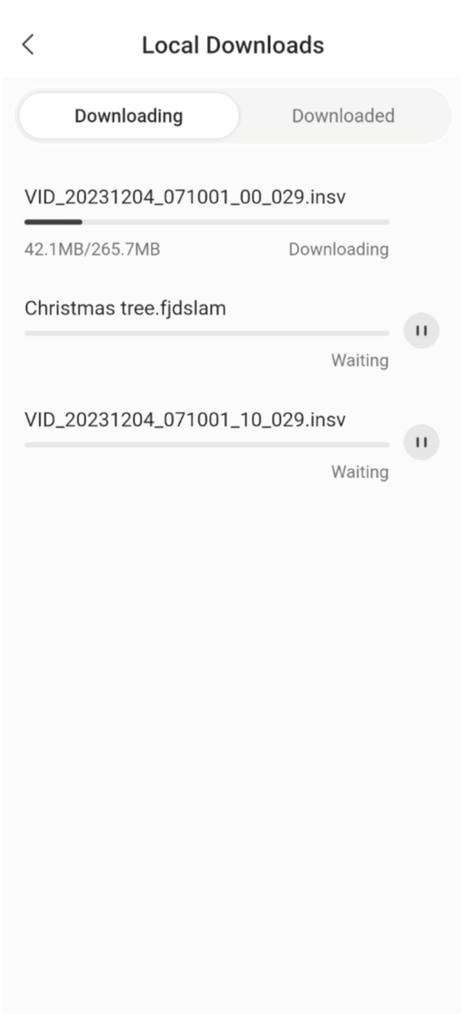



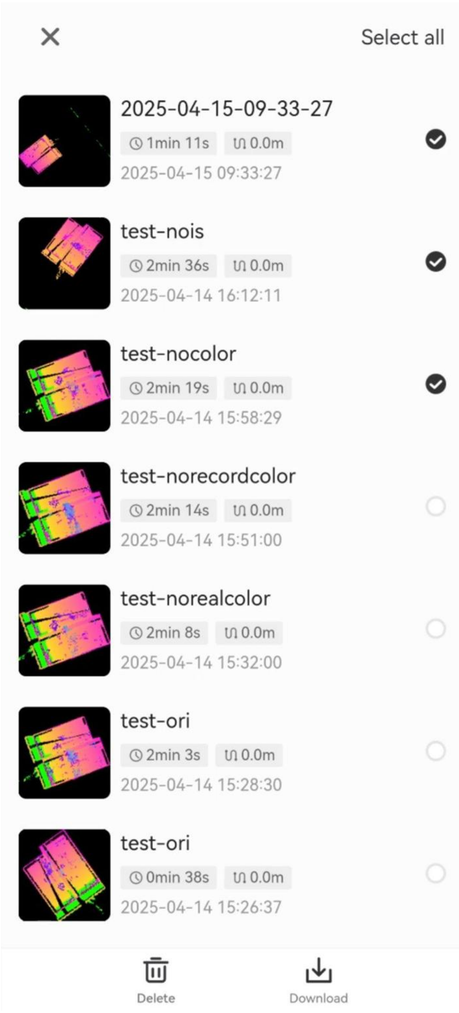



# Download results - local

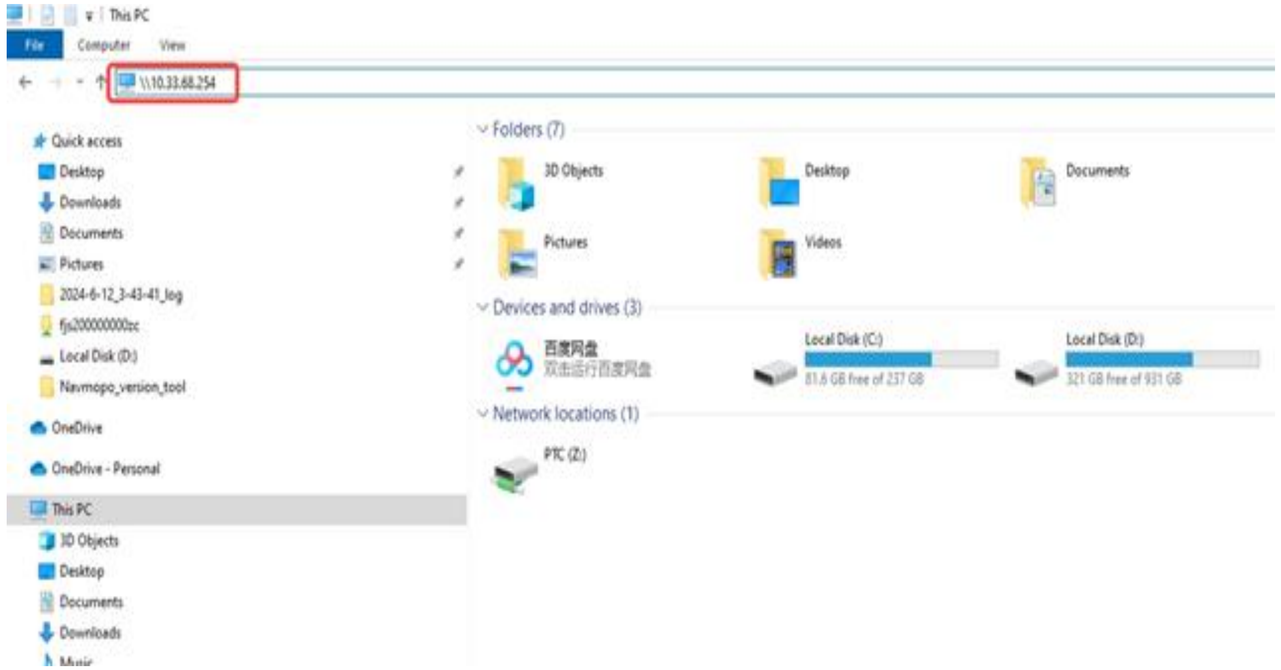



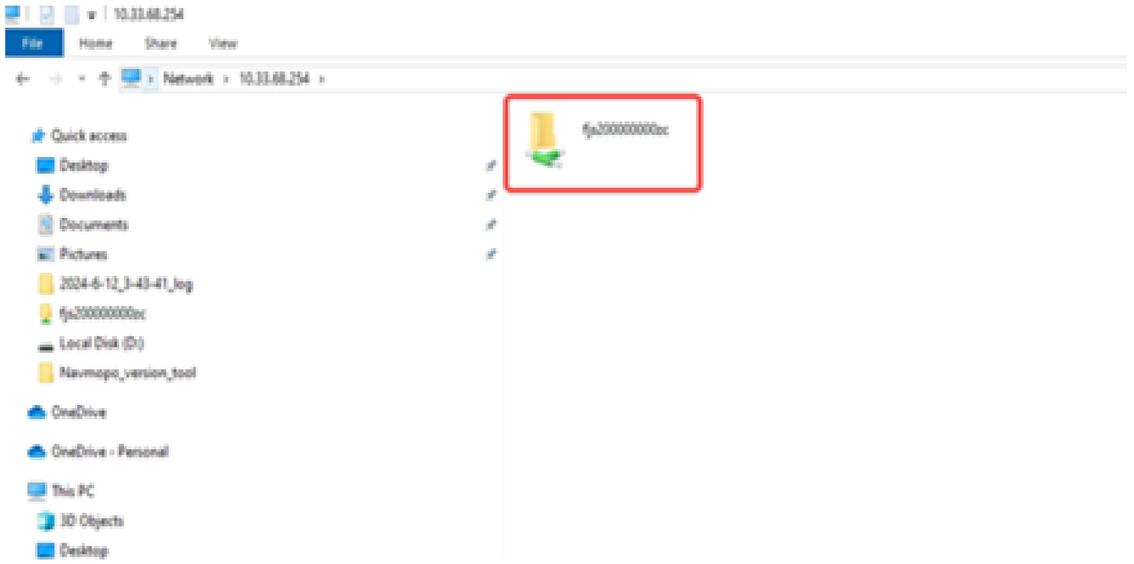




Click “more” and select download

Muti-download supported

# Download results - Type-c cable

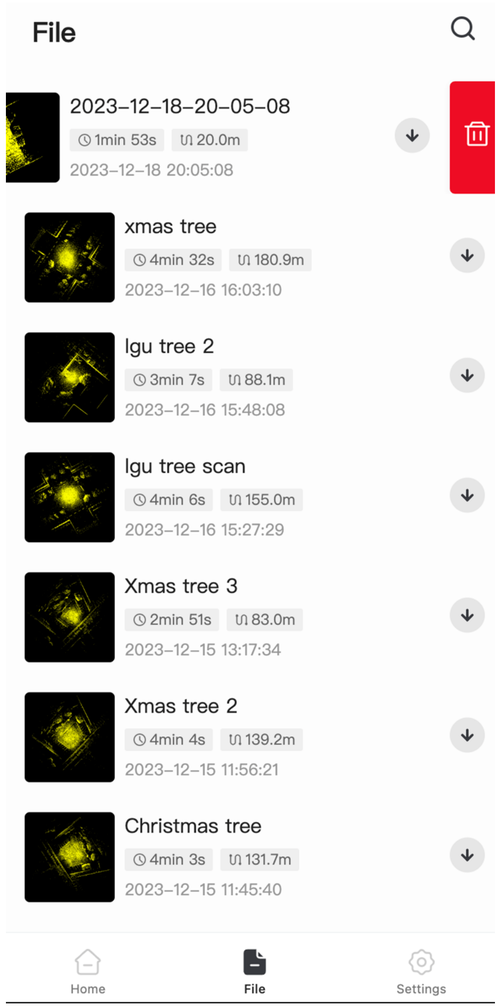


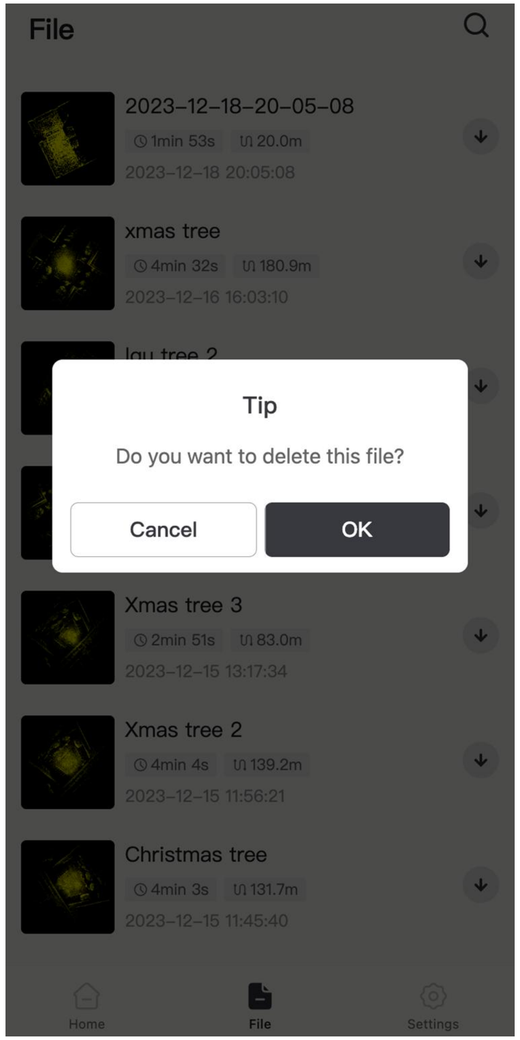



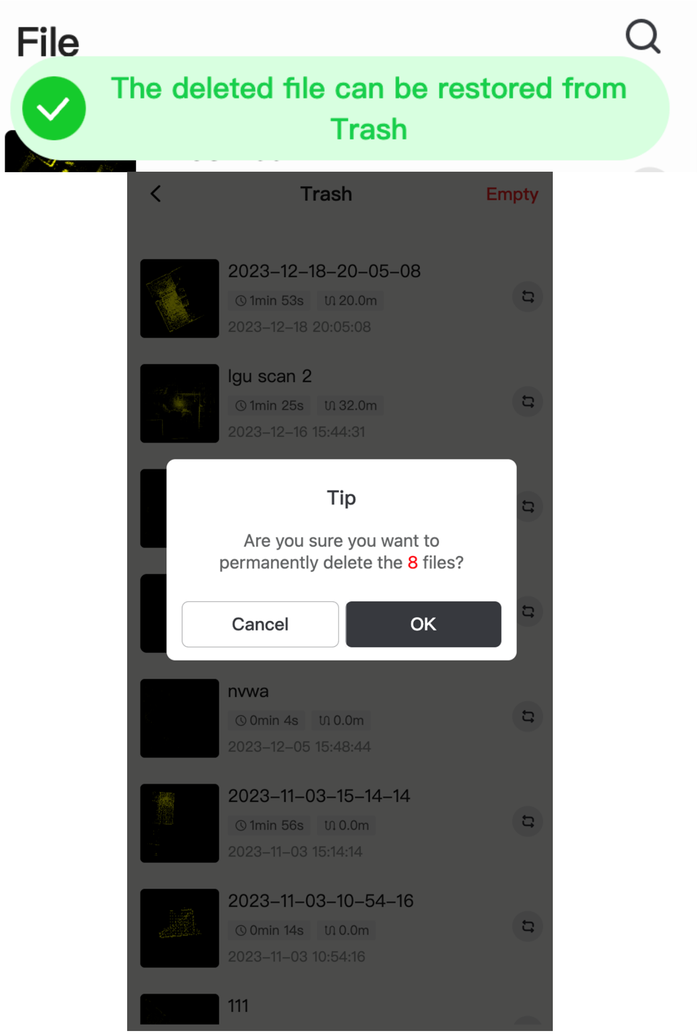

1. Connect Scanner and PC with TypeC cable

2. Enter \\10.33.68.254 in the computer's file explorer

# Manage files



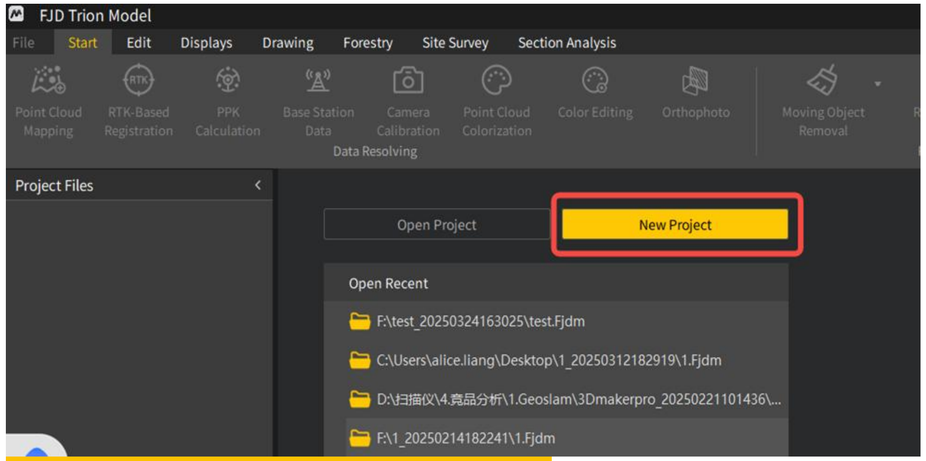

Slide files left to reveal trash bin icon

# FJD Trion Scan - Browser Version

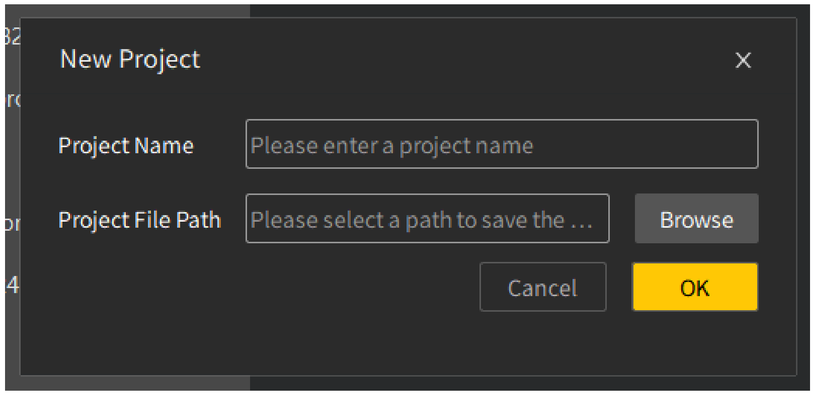

- Nearly identical interface as the App, and is updated in tandem with the App.
- Follow the same steps to connect:
  1. Connect your PC to S2's WiFi
  2. Enter 10.33.68.254 in a browser (Chrome recommended)

Great for downloading data in bulk onto the PC you're running FJD Trion Model on.

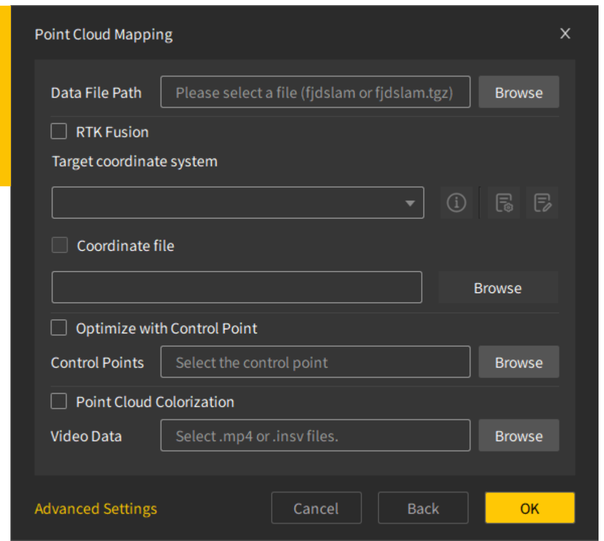
# Data processing-get las.data



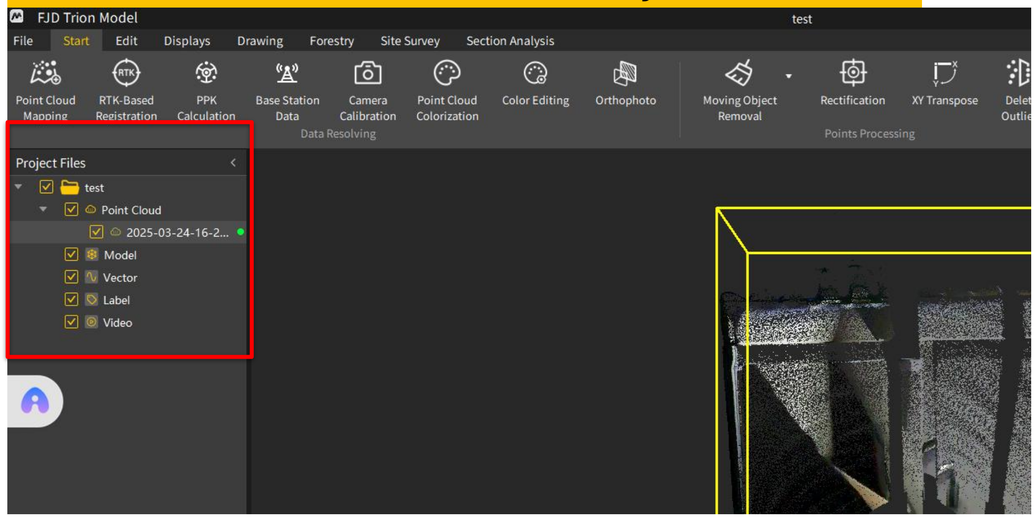

1. Create a new project




2. Click “Point Cloud Mapping” and drop the raw data accordingly




3. Check the las data under Project data



# How to Optimize Scanning Results

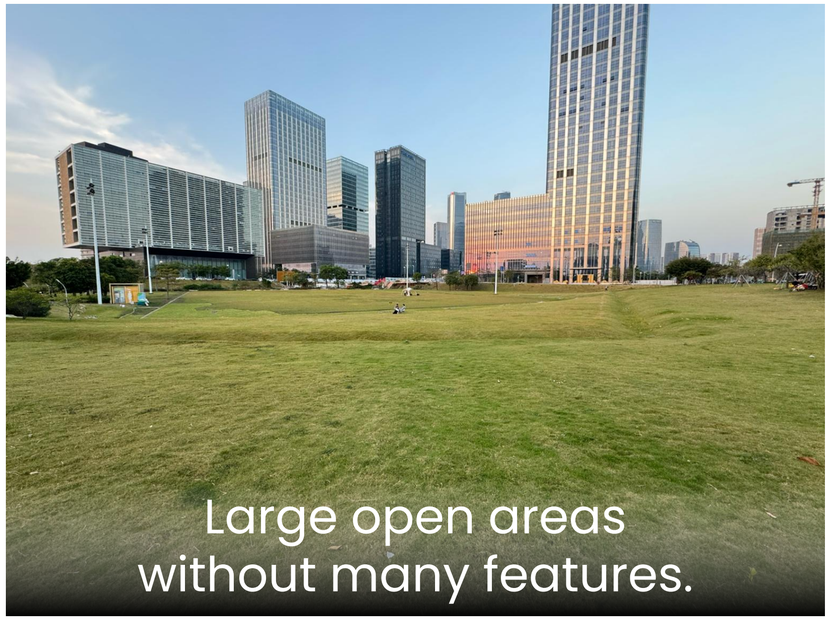
# Principles to remember

1. Evaluate the site ahead of the scan
2. Avoid moving people or objects
3. Initialize on a flat surface
4. Close the loops (Big and Small)!
5. Transition carefully between spaces

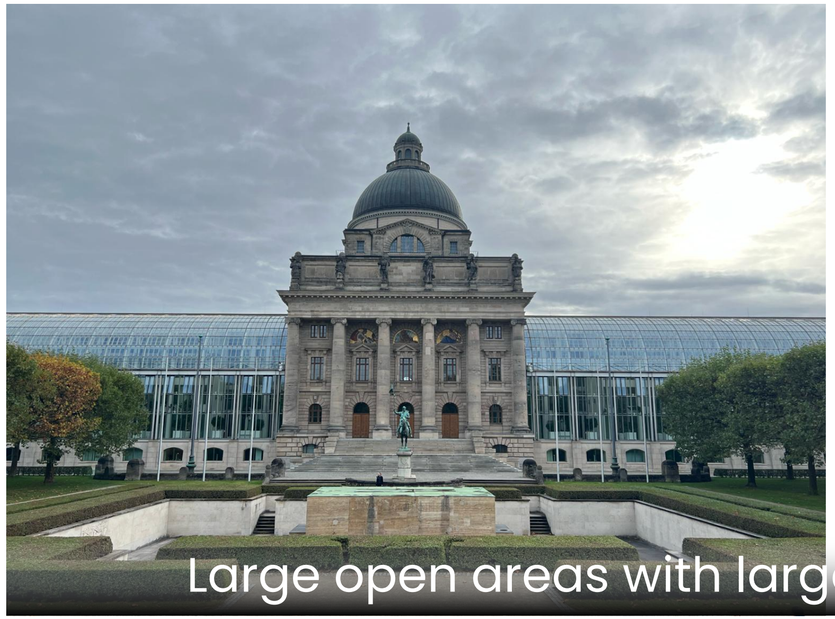
# Before you start

- **Equipment Check:**
  - Batteries charged, all parts of the scanner are in good condition.
  - No known data collection or download issues.
  - Clean the scanner head before every scan.
- **Site Evaluation:**
  - Before scanning, thoroughly assess the site by considering the following:
    - Divide the scan into sub-tasks if needed
      - e.g. multiple floors, indoor/outdoor, and complexity (staircases, rooms with a lot of windows).
    - Identify challenging areas (inaccessible or with uniform textures), as well as locations that may impact trajectory (obstructions).
    - Organize objects and structures (e.g., open all doors) to minimize movement during scanning.

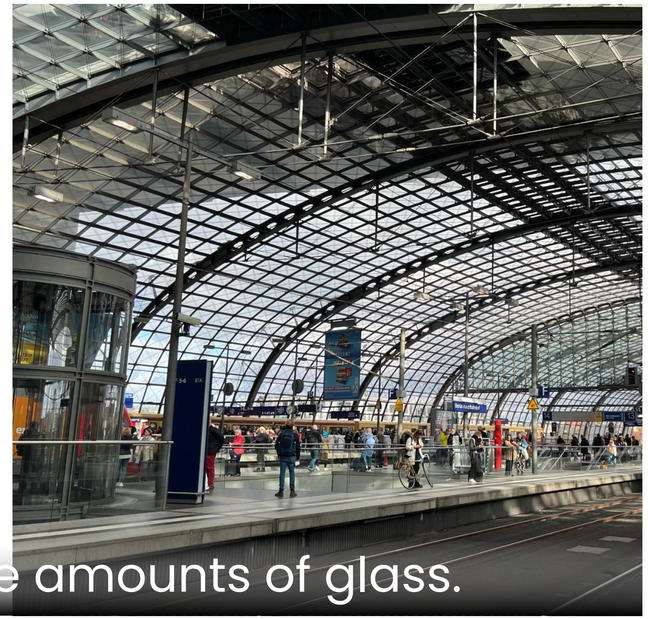
# Potentially Challenging Environments



Large open areas
without many features.



Large open areas with large amounts of glass.



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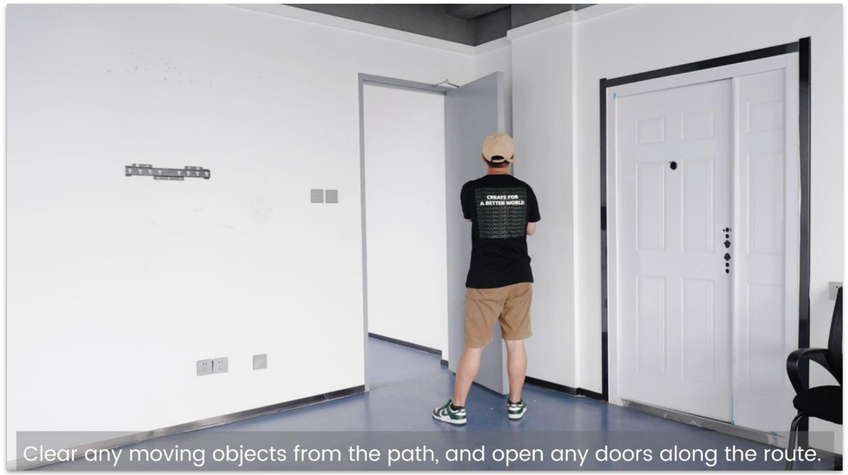
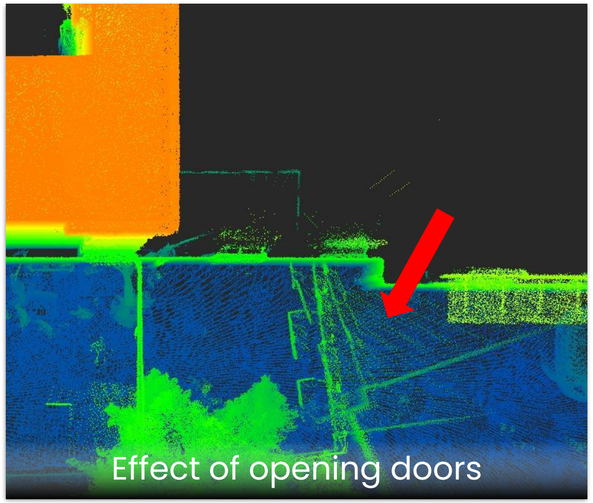
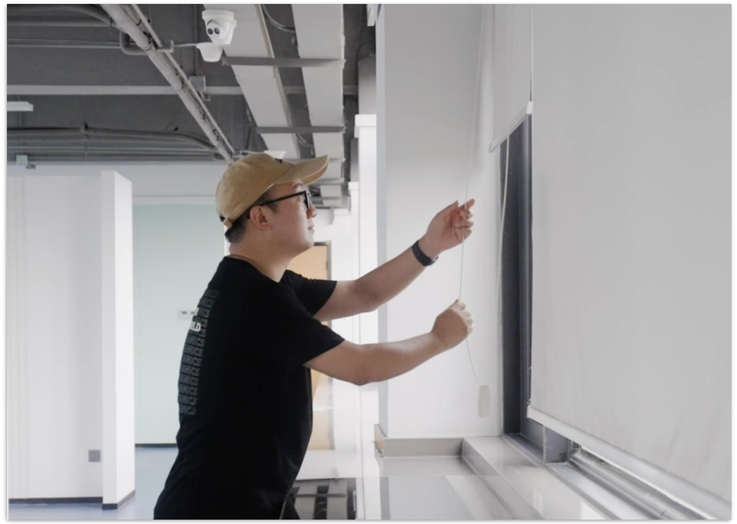
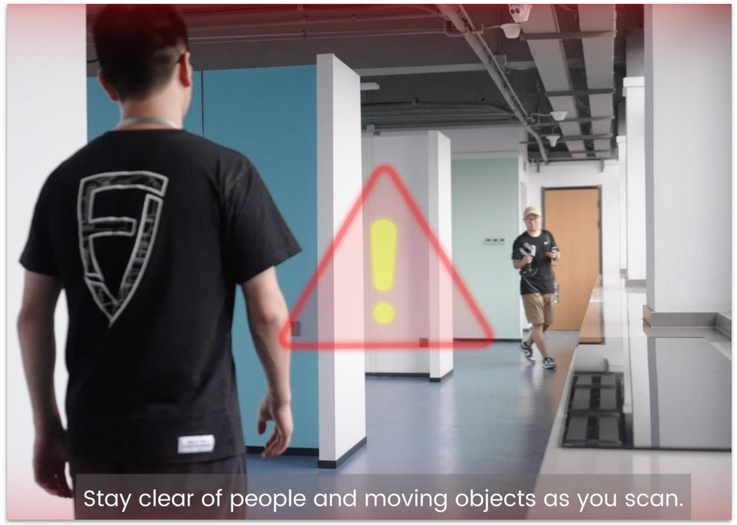
# General Recommendations

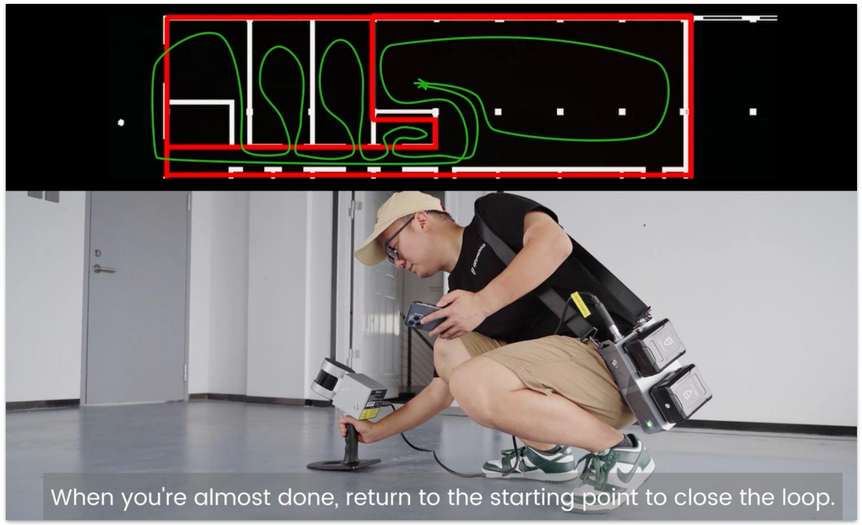

Clear any moving objects from the path, and open any doors along the route.


Place the scanner on a flat and stable surface and keep it still during initialization.


Effect of opening doors



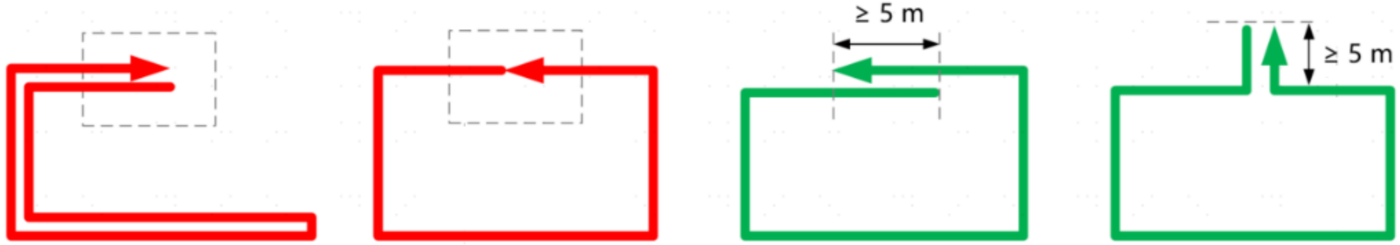

Stay clear of people and moving objects as you scan.


When you're almost done, return to the starting point to close the loop.

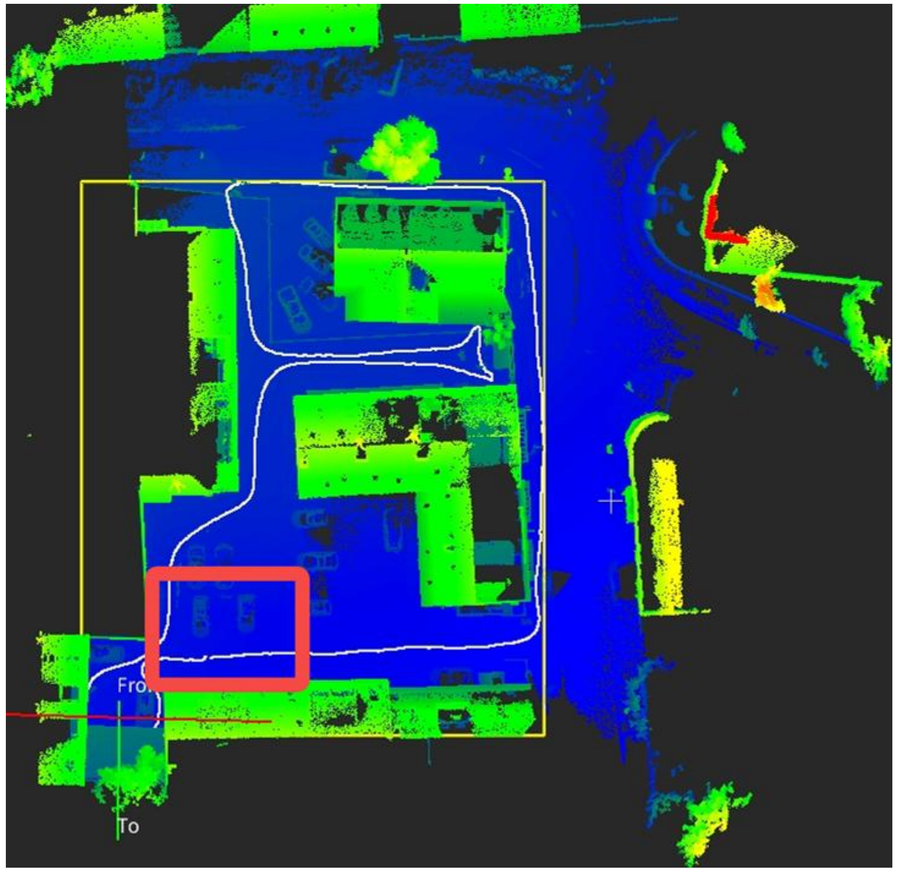
# Loop Closure

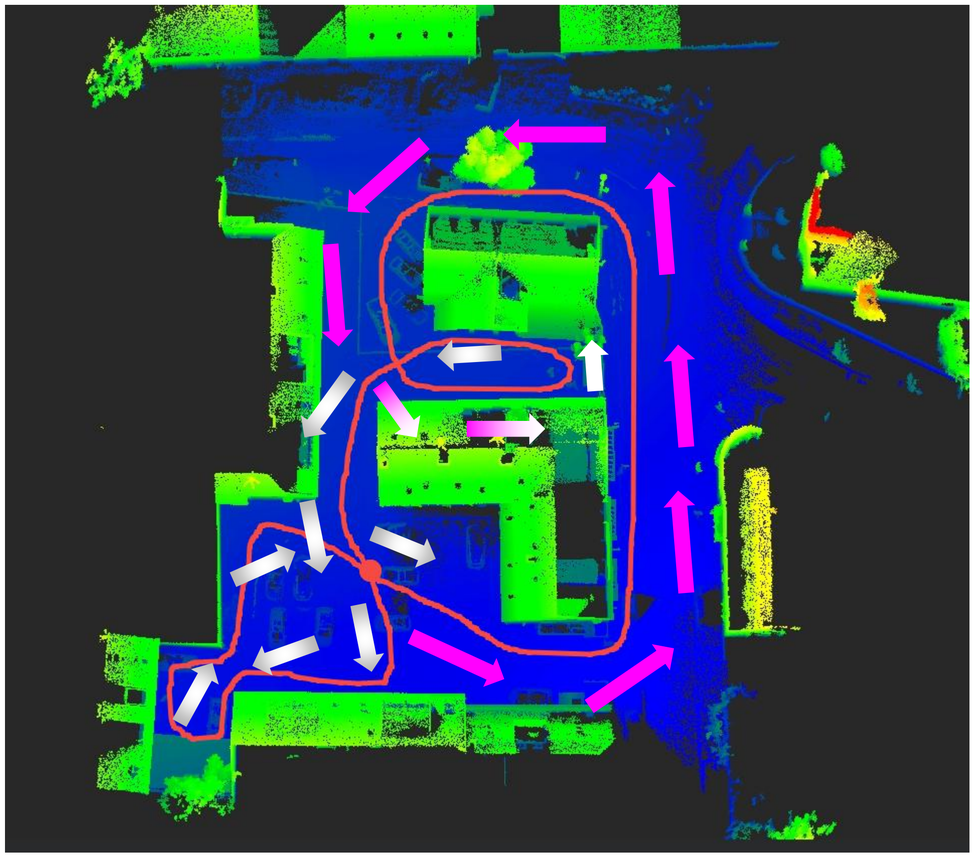
When in doubt, try to close a loop!

- **Close the loop at start and end** positions to reduce cumulative errors.
- Multiple **smaller loops** are better than 1 large loop.
- Make sure **at least one big loop** can be closed around the perimeter of the site.
- Plan out multiple smaller loops for rooms or areas that are connected to each other.

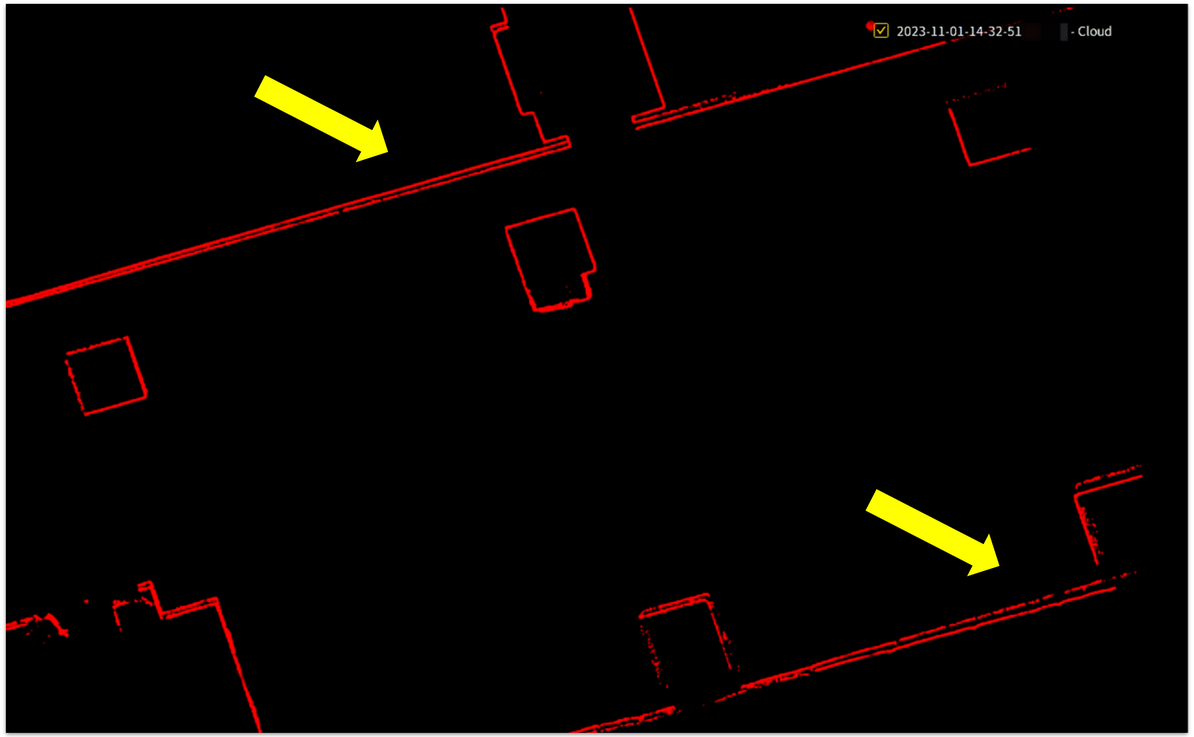



# Loop Closure Optimization Example



# Loop Closure – Results





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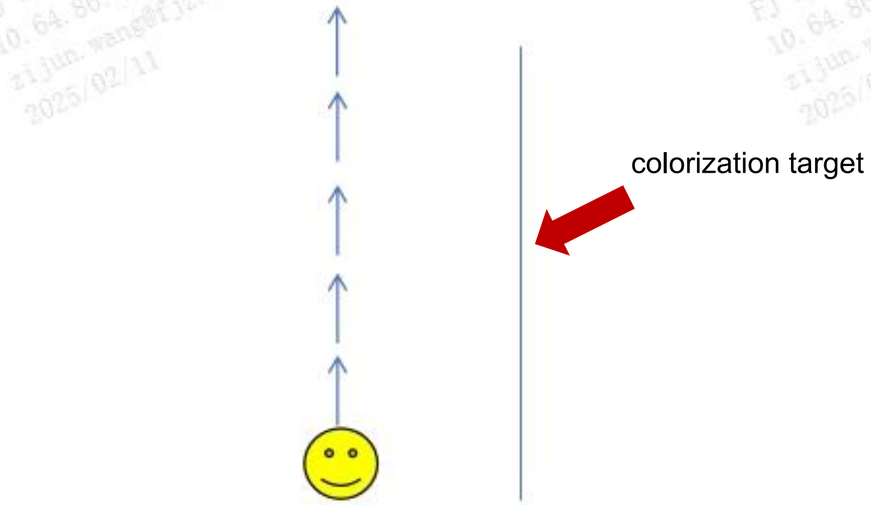
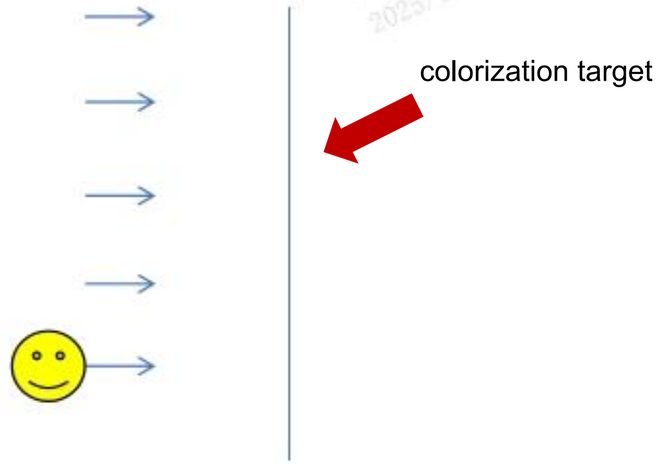
# Walking direction

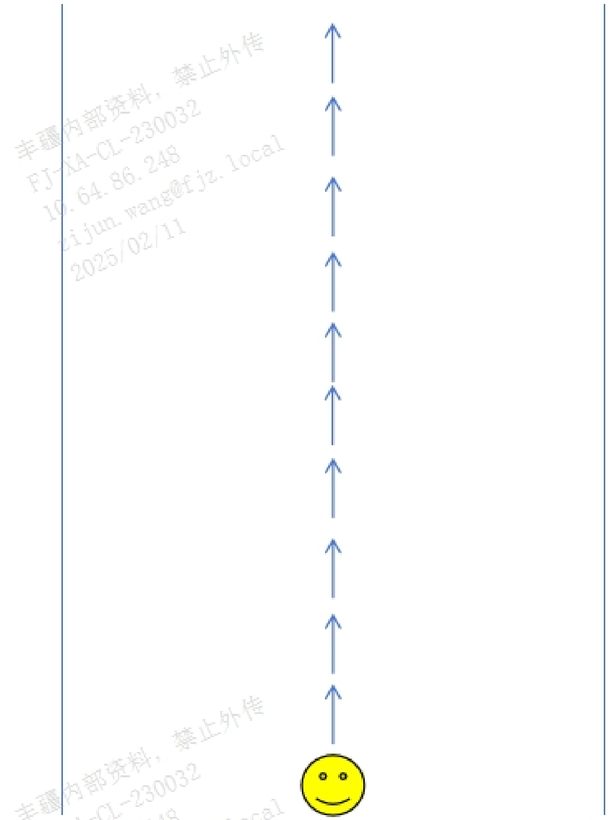



保持距离正常行走
maintain distance and walk normally

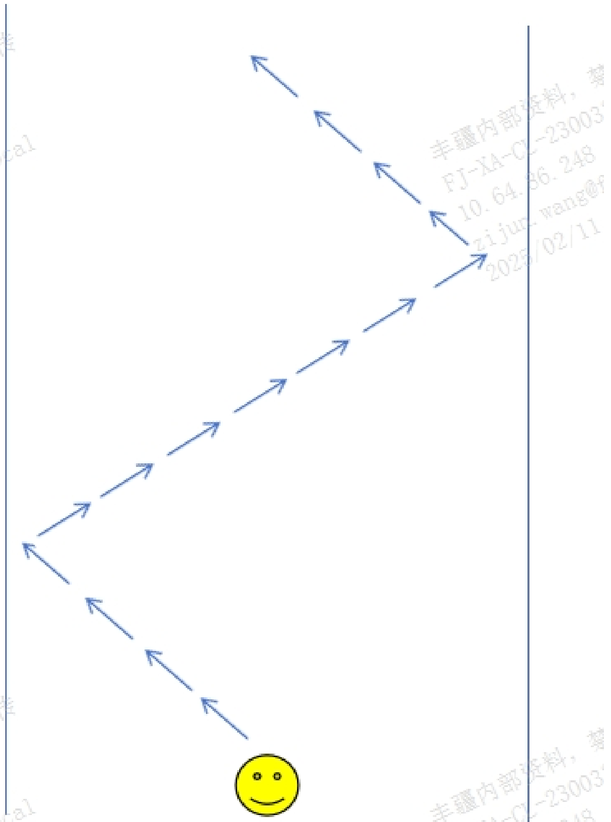



刻意朝向待赋色立面横移
deliberately facing towards the facade

# Walking direction

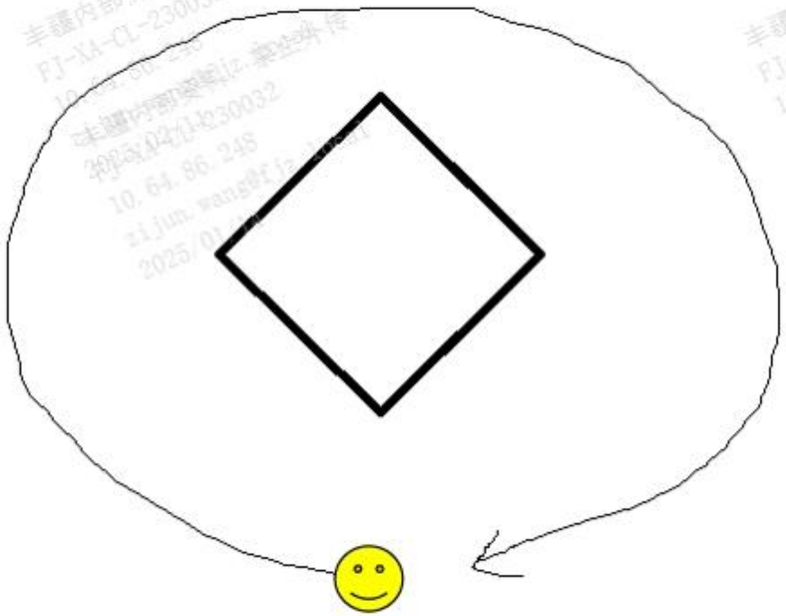


直线扫描 linear scanning

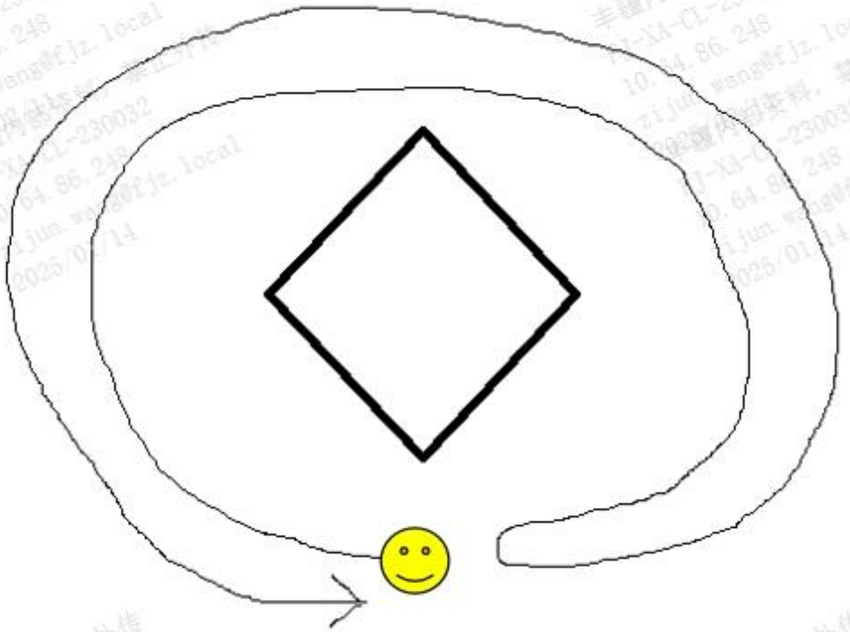


蛇形扫描 serpentine scanning

# Walking direction



单次扫描 single scan



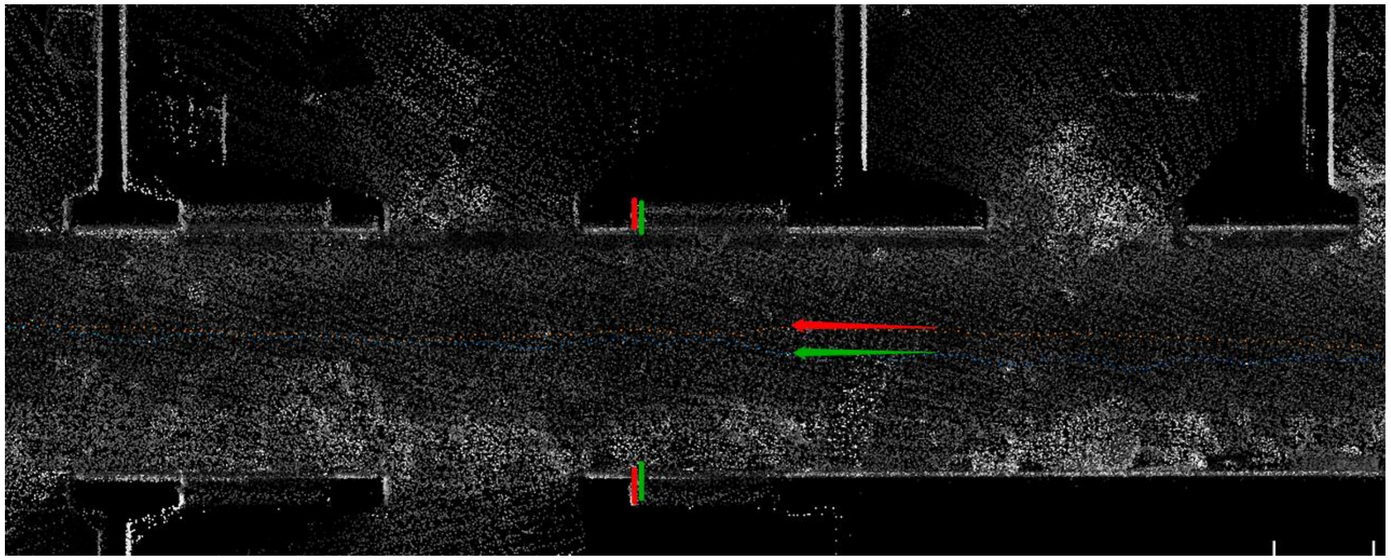
往返扫描 reciprocal scanning

# Corridors and Small Rooms

- Consider scanner FOV:
  - S2: 360° × 270°

- Scan separately
- Add features manually (chairs/stools etc.)
- Form small closed loops

Watch video



# Pro Tips

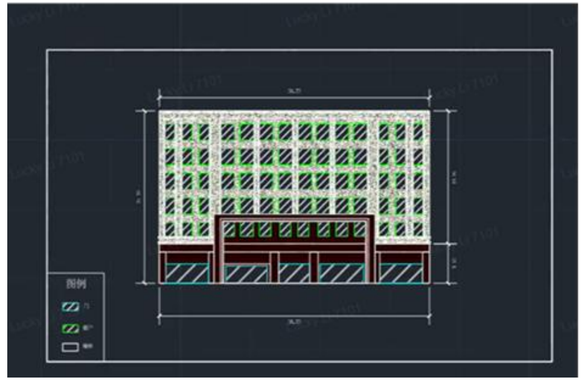
## Data Processing

1. **Clean the point cloud before registration**, like reflections, points behind glass and windows, and obvious noise from mirrors, filtering out low intensity points (values like  0, 1, 2, 3).
2. **Use targets to register point clouds.** If possible, and for high accuracy projects - use a control network measured with total station or RTK.
3. **Put the targets along your pre-planned scanning paths**. Best to put them in the direction of the scanner as you walk through the site. It’s not ideal to turn the scanner away from the targets.

# Case Studies

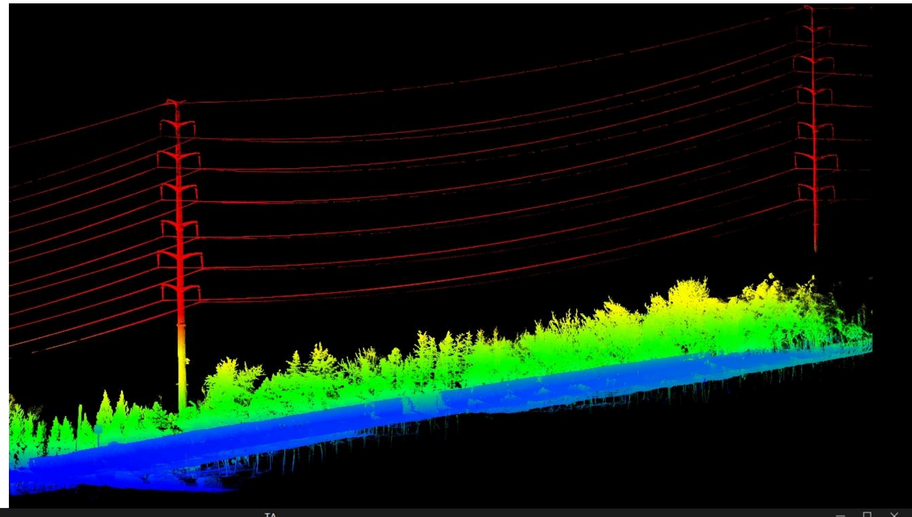
# Tokyo university

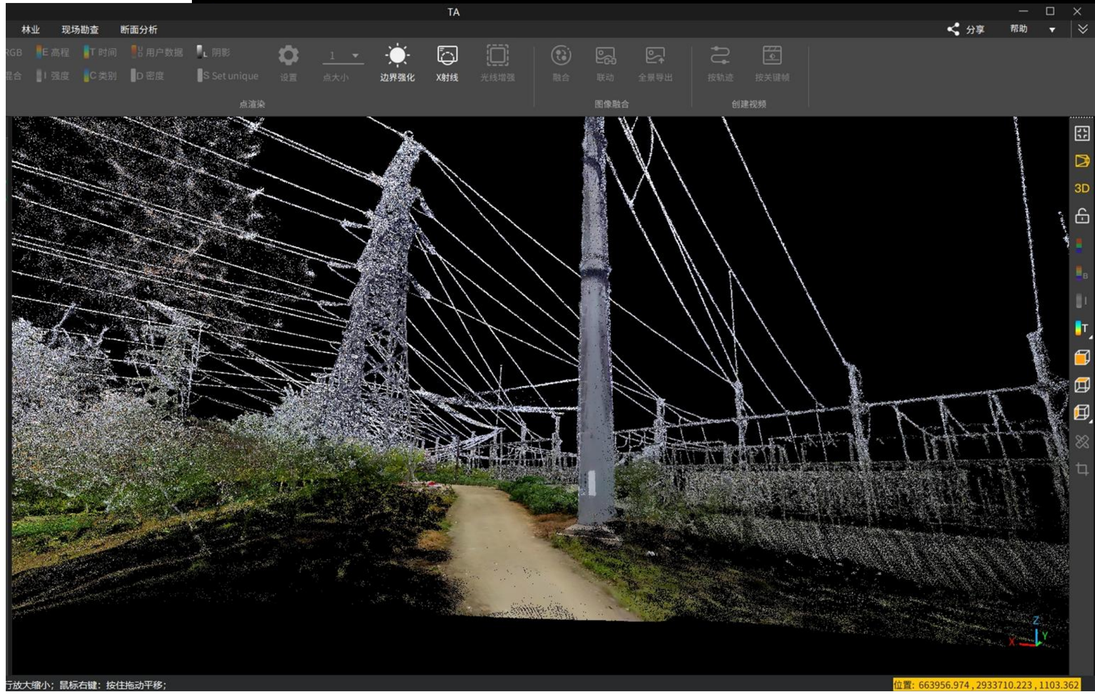
- High-altitude point cloud coverage
- Uniform density distribution
- Crisp texture information



# Powerline

Powerline inspection - scanned in a 20 minute walk



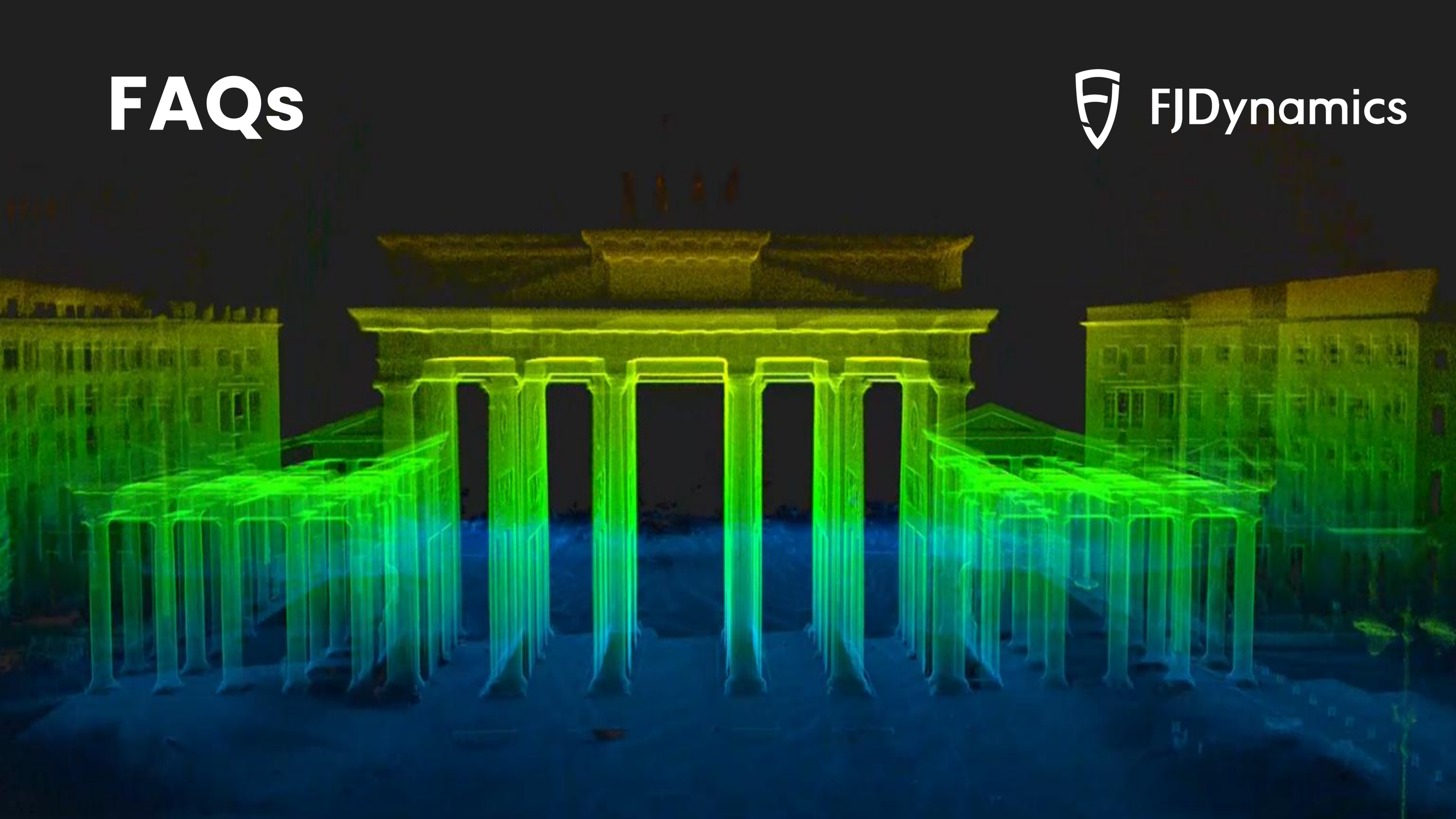


# Underground Tunnel

- **Project:** To inspect and digitize the locations of an underground mine in Japan
- **Efficiency and Speed:**Less than 5 minutes of walking covered 142 meters.

# FAQs

FJDynamics




FJDynamics
Thank you!