How to use the LRTK Phone

Reverse lookup manual

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Here is a list of things you can do with the LRTK Phone and software.
This is as of November 2024, and the number of things you can do continues to increase.

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1. Overview

Here we will explain the overview of the LRTK system.
Here's a guide to the initial setup for using the LRTK system.

overview
1-1 LRTK System Configuration
1-2 Changes with LRTK
1-3 Login and setup
1-4 Viewing and syncing data (common to all data)

2. Positioning
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3. Photos with high precision coordinates
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3-2 I want to display photos from the same location in chronological order
3-2 I want to check with AR display

The LRTK system consists of the high-precision GPS terminal LRTK Phone, LRTK apps available on iPhones, and LRTK cloud that can be accessed online from PCs, etc.

Configuring the LRTK System

LRTK App: https://apps.apple.com/jp/app/lrtk/id1641216786
LRTK Cloud: https://lconstruction.lefixea.jp/

LRTK Phone

High-precision GPS terminal.
Horizontal error ±2cm,
Vertical error ±4cm
With the accuracy of
Get latitude and longitude elevation.

High precision coordinates

High precision coordinates
Correction information for acquisition

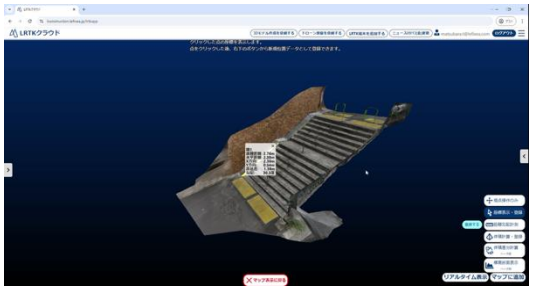
LRTK App

iOS app.
Using the coordinates of the LRTK Phone installed on the back of the iPhone, you can perform positioning, 3D surveying, AR display, coordinate guidance, etc.

Survey results

3D data
Coordinate data, etc.

LRTK Cloud



Web app.
Access from a PC, etc.
Map display of survey data,
3D display, download, upload, etc. possible.

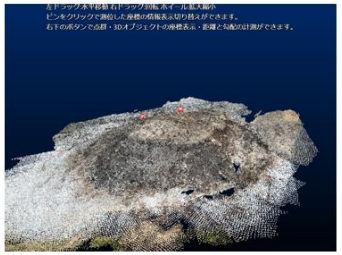
1-2 What to change with LRTK

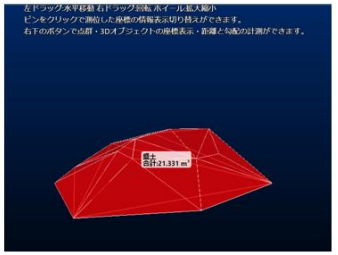
There are many changes in LRTK, but here are a few examples. You will be able to access these features immediately. In addition, almost all of the acquired data can be shared on the LRTK cloud.

Design

・Support design research with the positioning photography function
・Positioning and output sima
Assist in drawing creation
・Go to your destination using coordinate guidance
・Images after installation using the AR function
Share with client

Construction





・Get stake coordinates with coordinate guidance
・Understanding the construction image with AR display
・Volume calculations for immediate use at the site
Measure the amount of soil transported
・Different volume of 3D blueprints and current point clouds
and obtain the amount of soil transported.
・Confirm the current situation with AR to determine whether the design is as planned and manage the finished form
・Structural scan to obtain 3D models with absolute coordinates of buried pipes
・An AR display of buried pipes to consider excavation location

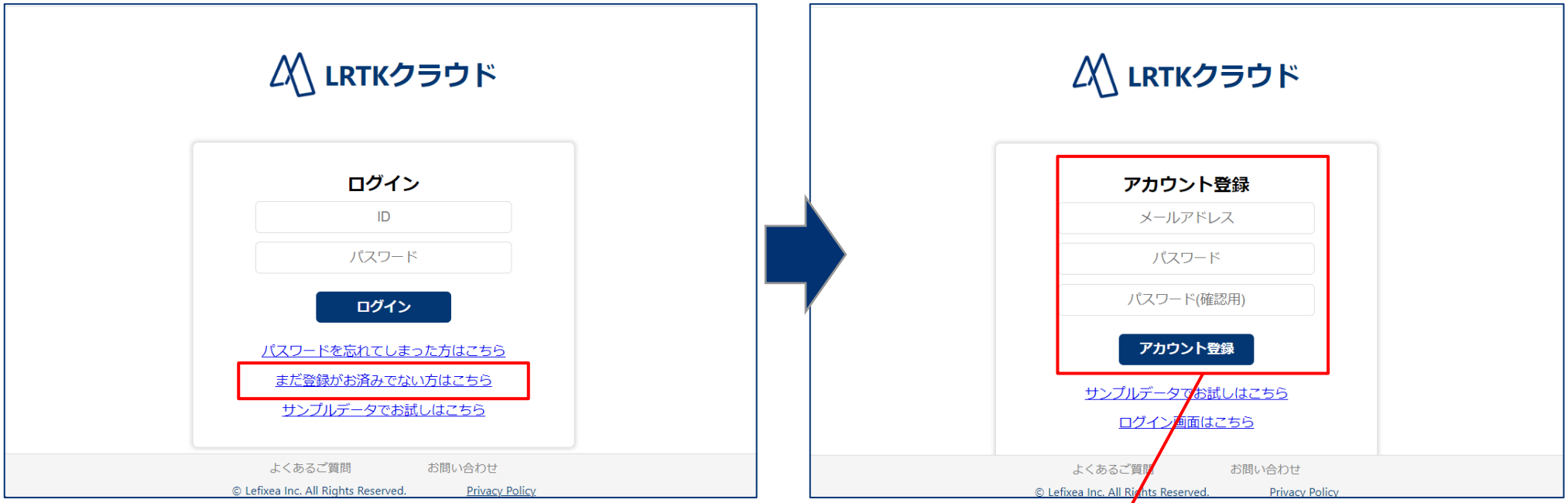
Maintenance

・Coordinate guidance to the inspection point
・Get a glance at the inspection location with AR
・Structural scans cause cracks etc.
Keep as a 3D file with absolute coordinates.
Crack width can also be measured through post-treatment.
- Map inspection results on 3D blueprints
・Time series display of inspection results
・Compare past point clouds and current point clouds

Create an account in LRTK Cloud and log in from the login screen.

How to create an account

LRTK Cloud Login Screen: https://lconstruction.lefixea.jp/auth/login



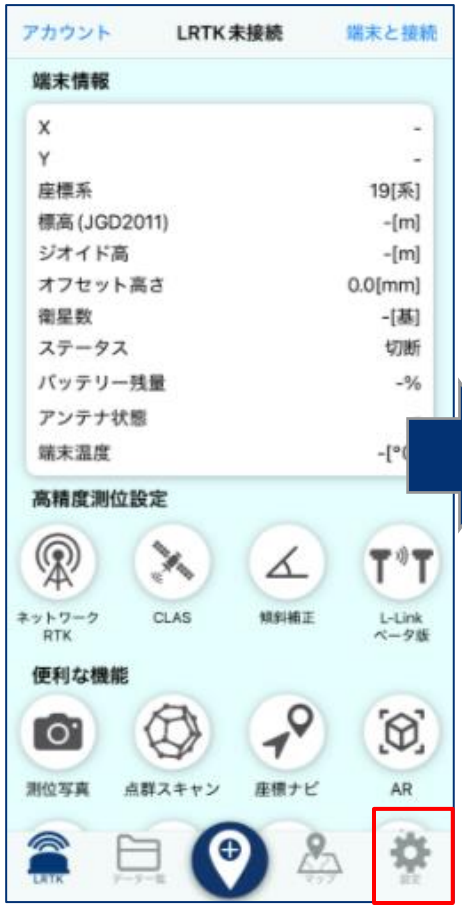
Register your account information and press the Account Registration button.
You will receive an email at your address. Go to the link provided in the email and enter the required information to complete your account registration.

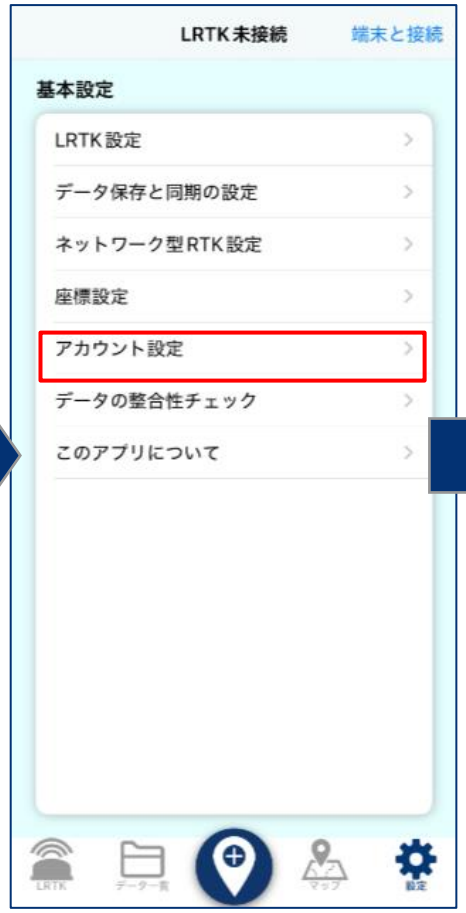
Log in with the LRTK app

Please install the LRTK app on your iPhone and log in from the app's account settings.
(Settings → Account Settings → Login)

Log in with the LRTK app

LRTK App: https://apps.apple.com/jp/app/lrtk/id1641216786





After purchase, your person in charge will inform you of the paid feature activation.
If it is displayed as standard, all functions are available.

Data synchronization between the LRTK cloud and the LRTK app can be performed by pressing the sync button.Uploaded data can be viewed/edited in the cloud.

How to view and sync data

All data that can be viewed using the LRTK app can be viewed from the Data List tab.
The destination represents the group (like a folder) to be saved.
If you press the sync button on the top right of the screen, all results obtained using the LRTK app will be uploaded to the cloud, and all data added in the cloud will be downloaded to the app.
*Some data may not be uploaded to the cloud. (Example: Positioning video)

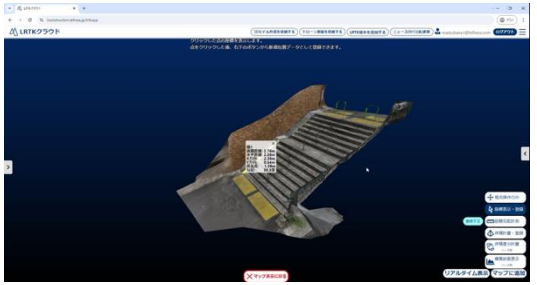
LRTK App

When pressing the sync button

Upload all surveyed data

Download all data added in the cloud

LRTK Cloud



2. Positioning

Here we will explain how to obtain high-precision position information.

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2-5 I want to find the stake coordinates using coordinate guidance/I want to find the reference point

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3-1 I want to save photos with high-precision coordinates, orientation and orientation
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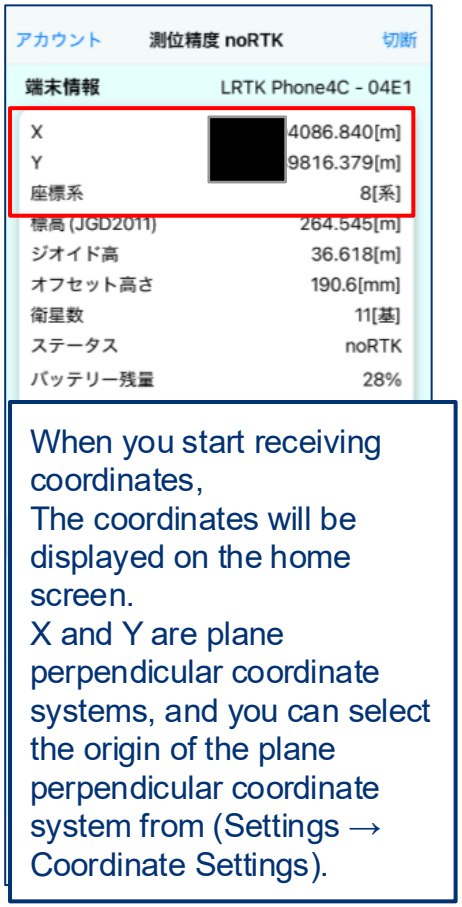
2-1 I want to obtain high-precision coordinates

Turn on the LRTK, connect the iPhone to the LRTK, and place the LRTK in an open area outside to start positioning in about 40 seconds. At this stage, the positioning accuracy is still around ±10m.

How to get coordinates

About the origin of plane perpendicular coordinate system: https://www.gsi.go.jp/sokuchikijun/jpc.html

Press the Device and Connect button to see the nearby LRTK.
Please select the LRTK you want to connect to.
If the connection is successful,
A sound will be heard from the LRTK terminal.

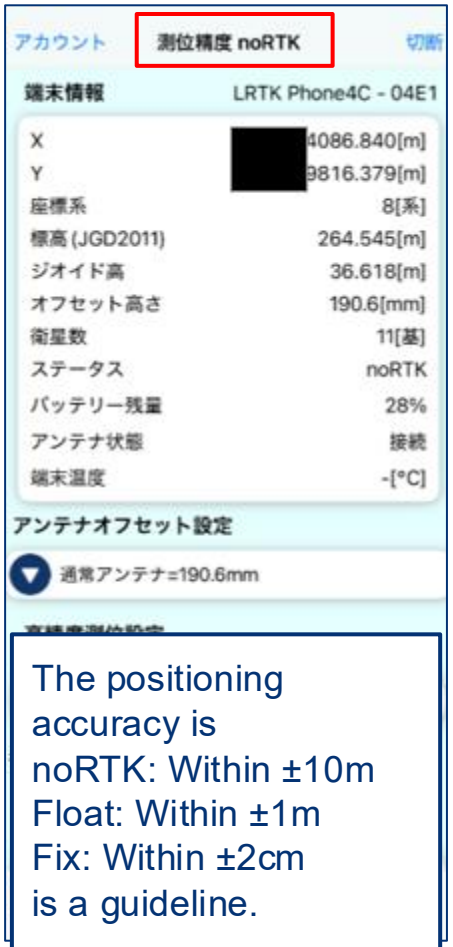


When you start receiving coordinates,
The coordinates will be displayed on the home screen.
X and Y are plane perpendicular coordinate systems, and you can select the origin of the plane perpendicular coordinate system from (Settings → Coordinate Settings).

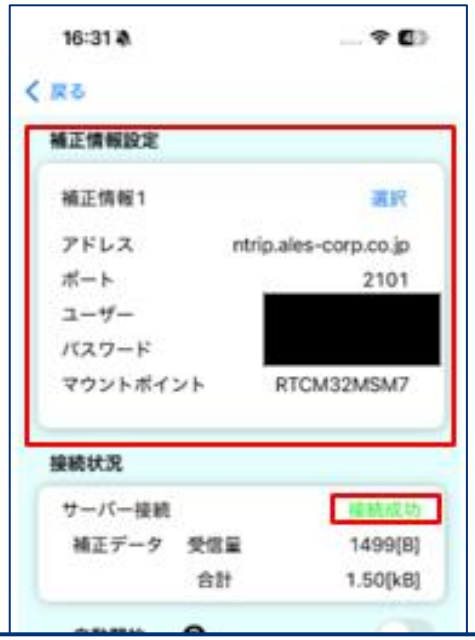
How to obtain high-precision coordinates

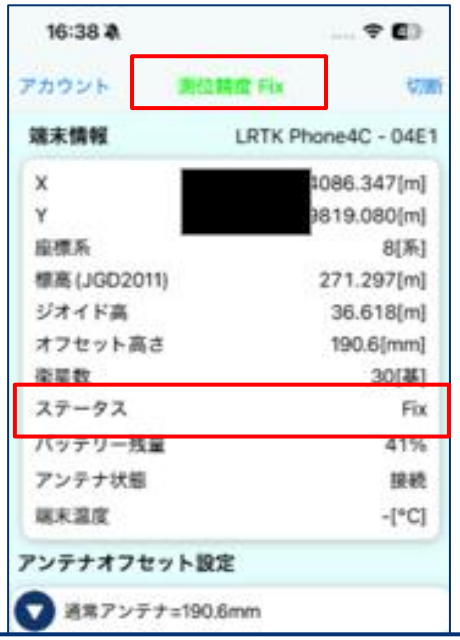
To use LRTK to position with ±2cm accuracy, use the network RTK function.
When using most functions, it is recommended to set the coordinate precision to Fix.

How to get coordinates



The positioning accuracy is
noRTK: Within ±10m
Float: Within ±1m
Fix: Within ±2cm
is a guideline.



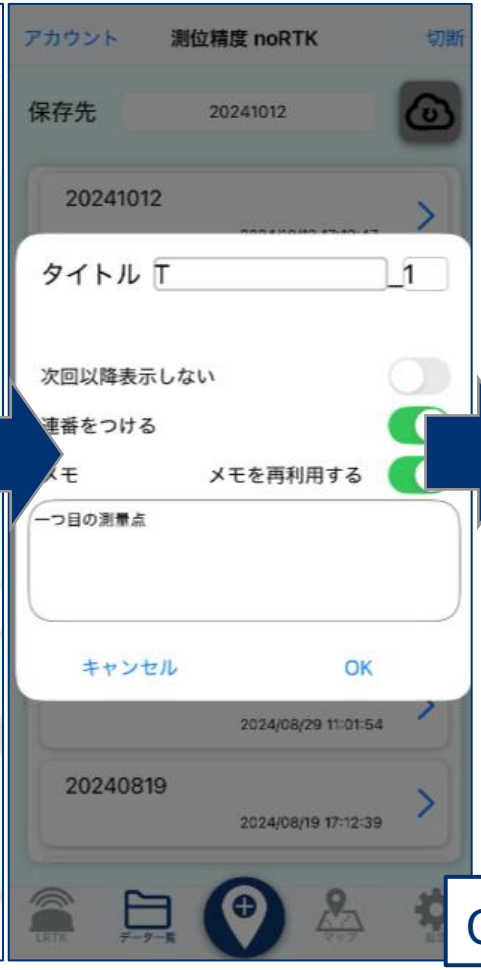


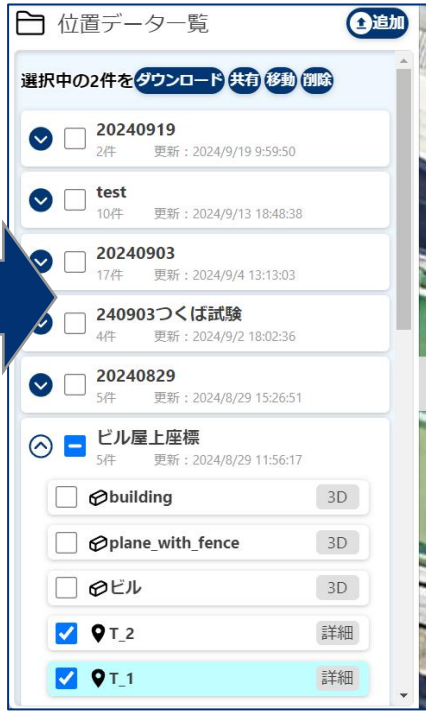
Select the correction information created in 1-2 from the Home screen → Network RTK. Please start sending.
If your iPhone is connected to the Internet and there are no errors in the input information, it will be displayed as a successful connection.
If the sky is open enough, the positioning accuracy will change to Fix in about 20 seconds.
With this
The high-precision coordinates were successfully acquired.

How to save high-precision coordinates

The coordinates can be saved with one button. You can add point names and notes to coordinates.After syncing to the cloud (reference 1-4), you can view it in the cloud.

Saving coordinates and viewing them in the cloud

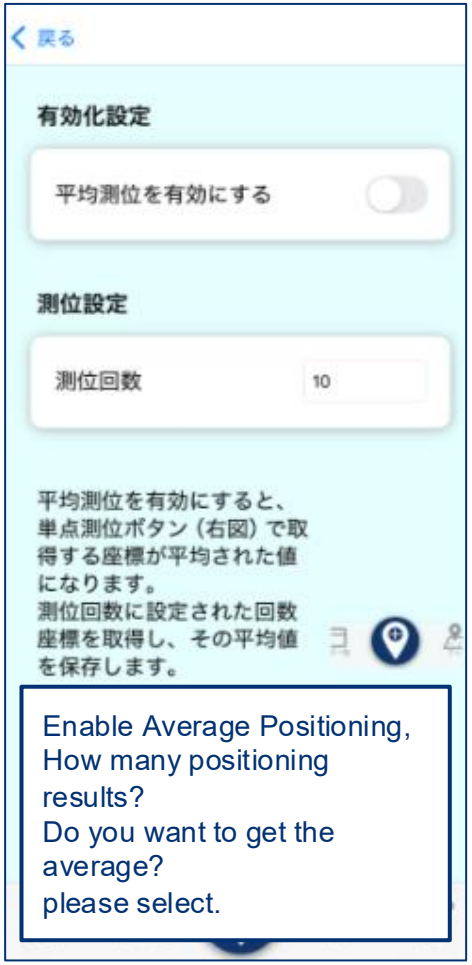




Checked data will be displayed in the list on the left.

If you want to obtain more accurate coordinates, use the average positioning. After setting, if you save the coordinates using the method 2-1, the average positioning will begin.

Setting the average positioning



2-3 I want to get the coordinates of the tip of the stone stool/monopod tip

The LRTK starter kit comes with a special monopod and stone thrust. If you want to get the coordinates of the tip of the monopod rather than the LRTK coordinates, correct the height of the instrument in the app settings.

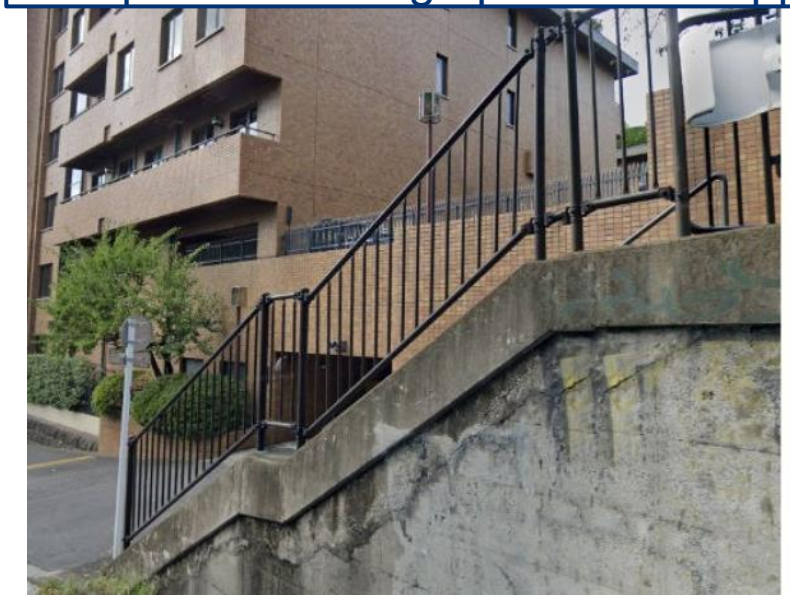
Coordinate height offset setting

From the antenna offset setting on the home screen,
The height can be corrected by selecting the device during positioning.
Set the correction, use the horizontal device to level the monopod and press the positioning button.
The latitude and longitude elevation of the tip of the monopod can be obtained.

You can use the logging function to obtain movement trajectories.
This can be used when you want to obtain a boundary line by walking along the boundary line.

How to obtain moving trajectory

The path of moving up the stairs appears to be in a staircase



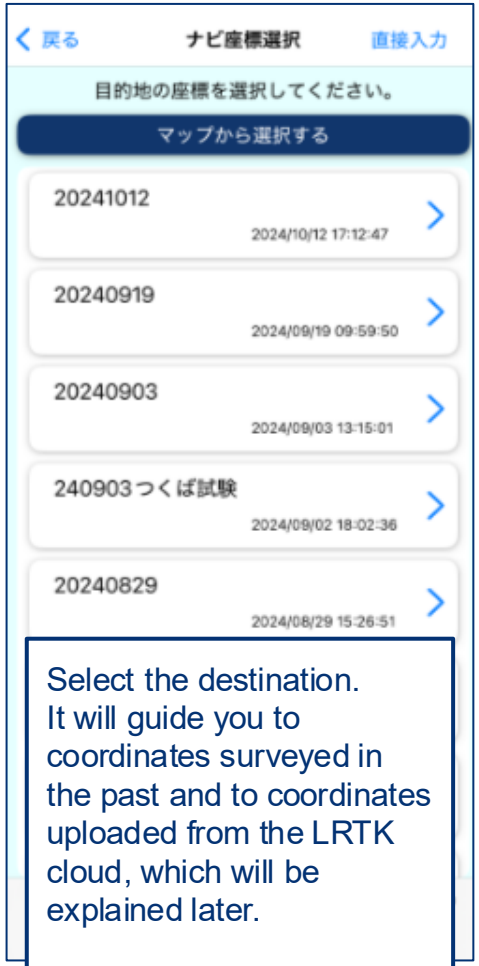
Pressing the logging button will start acquiring the movement trajectory.
Press again to finish.
You can check the data using the method described in 1-4.
Similarly, it can be displayed in sync with the cloud.
You can change the data saving cycle from (Settings → Data Storage and Synchronization Settings).

Synchronized moving trajectory data can be viewed on the LRTK cloud and downloaded in CSV format.

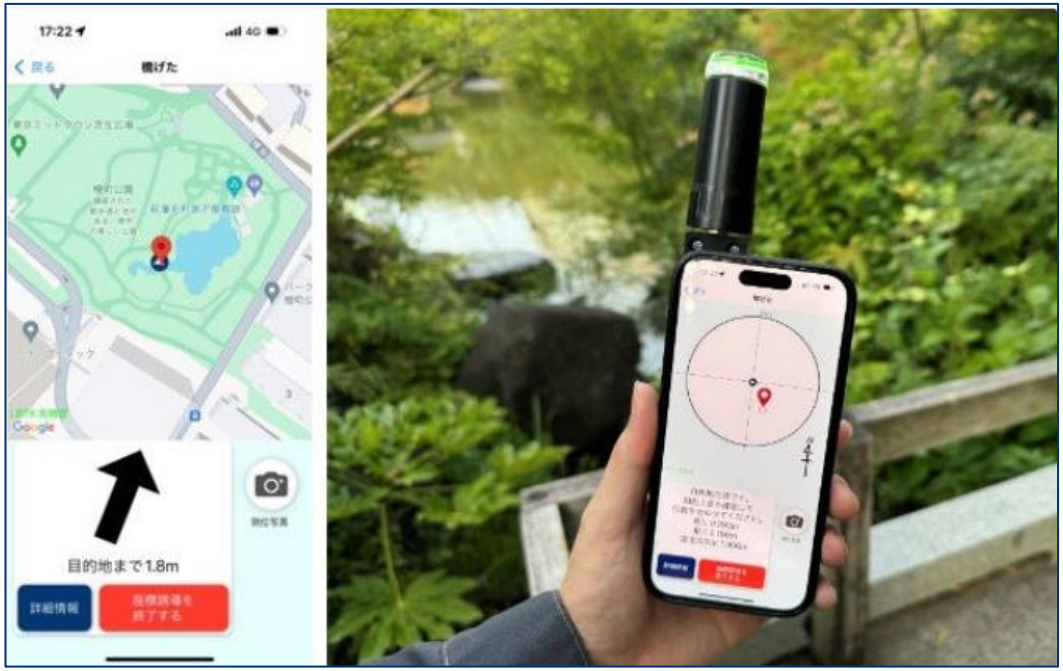
Viewing LRTK Cloud

When you want to find the coordinates of stakes or when you want to find a reference point that is hidden by plants and becomes invisible,The coordinate guidance function is available. You can go to the coordinate points you uploaded in the cloud.

How to use the coordinate guidance function



Select the destination.
It will guide you to coordinates surveyed in the past and to coordinates uploaded from the LRTK cloud, which will be explained later.



When you approach the target coordinates, the screen will adjust the coordinates with cm accuracy.
Transition will occur.

3. Photos with high precision coordinates

Here we will explain how to obtain high-precision position information.
It can be used conveniently for inspections, design surveys, disaster investigations, and more.

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3-2 I want to check with AR display

By using the positioning photography function, you can save coordinates and photos as a set.
Data can be viewed and synchronized to the cloud using the method described in 1-4.

How to use the positioning photography function

By pressing the shooting button, you can enter and save the title and memo in the same way as the data obtained in 2-1.

How to view data obtained using the positioning photo function

Data synchronized using the method 1-4 can be viewed on the LRTK cloud. It is stored in conjunction with the shooting direction, so you will not be able to make a mistake by reviewing it later when inspecting or conducting a disaster investigation.

Positioning photos on the LRTK cloud

The yellow arrows indicate the direction of the shooting.
It is also possible to output a set of photos, titles, and memos in PDF format like a daily report.

It is also possible to display photos from the same location in chronological order. Data with the same title of the group and positioning photo to be saved will be compiled as one piece of data. It is convenient for checking for ageing.

How to use time series display

The storage group inspects and the positioning photo data with the title prohibited parking is all collected. Click Details to display time series data. You can also change groups saved in the cloud/positioning photos titles,

You can also combine AR display, coordinate guidance and positioning photos to make inspections even more convenient.

Check with AR display

Select the data to display

Previously acquired data is displayed in AR

Using AR display, you can display a list of previously surveyed coordinates and coordinates uploaded from the cloud.
It allows you to list past inspection data in AR display, take a picture towards it, and add it to the time series data.
Detailed usage of the AR function is provided in the AR chapter.

4. Measurement on site

LRTK allows you to obtain distance/area/volume on-site amounts such as distance/area/volume. Here we will explain how to use it.

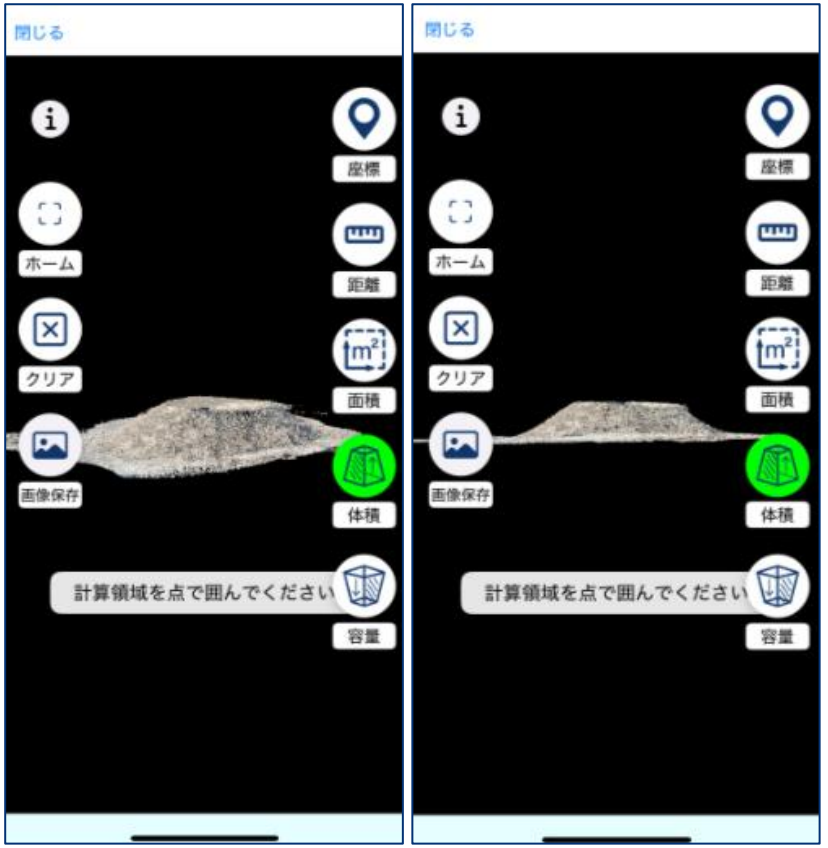
4. Measurement on site
4-1 I want to obtain a point cloud with absolute coordinates
4-2 I want to get coordinates from a point cloud with absolute coordinates
4-3 I want to find the distance at the site
4-4 I want to find the area at the site
4-5 I want to find the volume/volume at the site
4-6 Want to create high-precision 3D files on site
4-7 I want to find a large volume/volume at the site

5. Measurement in the office
5-1 I want to get absolute coordinates from a point cloud in the cloud
5-2 I want to calculate the distance in the cloud/I want to register a line segment
5-3 I want to find volume/volume using the cloud
5-4 I want to find the volume of soil mass needed to follow the design plan
5-5 I want to compare past point clouds with current point clouds
5-6 I want to check the cross section of a point cloud or 3D file
5-7 I want to take photos to use for photogrammetry

4-1 I want to obtain a point cloud with absolute coordinates

By scanning the terrain using the LRTK app, you can save the terrain with point clouds with absolute coordinates. This time, we will use embankments as an example to obtain the height, area, and volume of the embankment.

Examples of embankment and point cloud data

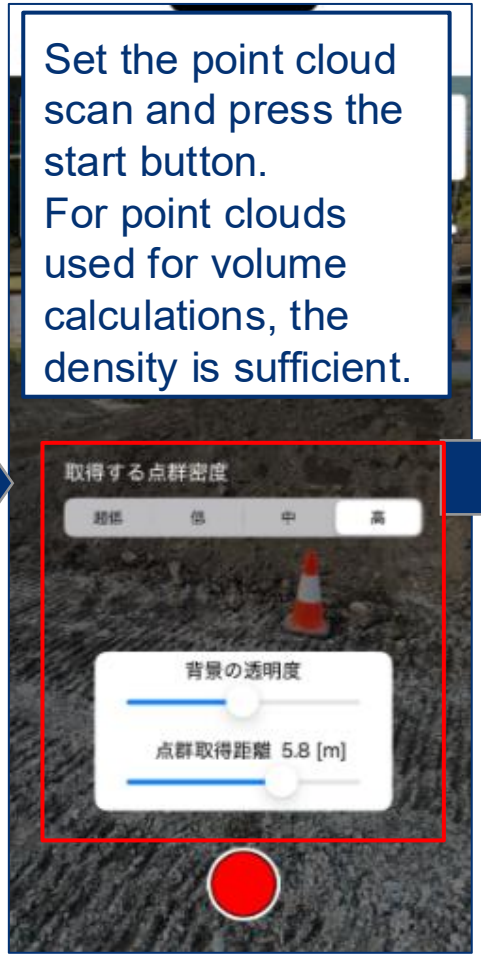


How to get point clouds with absolute coordinates

Point cloud scans can be performed without any problems with a medium density or higher.
You can scan the target without any problems while overlapping it with the background.

How to get point clouds with absolute coordinates

Select Point Cloud Scan.



Set the point cloud scan and press the start button.
For point clouds used for volume calculations, the density is sufficient.

Do a scan.
6m between start and end
Please walk more. The point clouds obtained during this time will also be given absolute coordinates.

Once the acquisition is complete,
Press the check button at the bottom right.

4-2 I want to get coordinates from a point cloud with absolute coordinates

It is possible to obtain absolute coordinates from a point cloud.
You can check the point cloud from the data list in the description 1-4.

Displaying absolute coordinates in the Point Cloud Viewer

Click Save Image to
A screenshot of this screen is saved as a positioning image.
Can be synchronized to the cloud.

Open the point cloud from the data list and tap on the coordinates.

Tap the point you want to measure and the coordinates will be displayed.

4-3 I want to find distance at the site

It is possible to obtain the distance between two points from a point cloud.
You can check the point cloud from the data list in the description 1-4.

Displaying distances in the point cloud viewer

Click Save Image to
A screenshot of this screen is saved as a positioning image.
Can be synchronized to the cloud.

Open the point cloud from the data list and tap on the coordinates.

When you tap the two points you want to measure the distance, the distance will be displayed.
It will be displayed.

How to find the distance from the positioning point

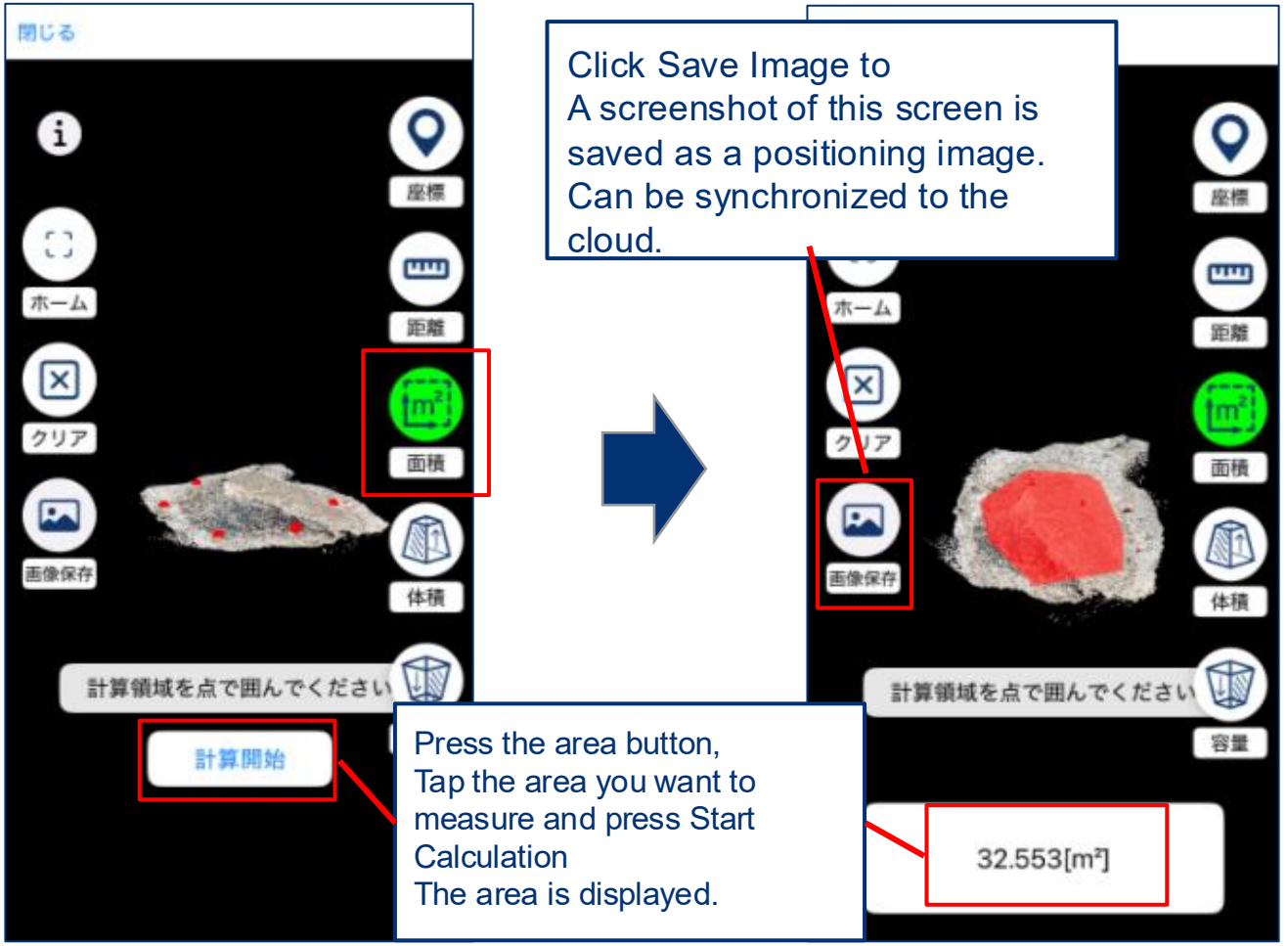
There is also a way to get the distance from two positioning points. By saving distances using the two-point distance measurement function, you can check the 3D distance between two points, horizontal distance, height difference, etc. on-site from the data list.

How to find the distance from the positioning point

4-4 Finding the area at the site

It is possible to obtain the area from the point cloud.
You can check the point cloud from the data list in the description 1-4.

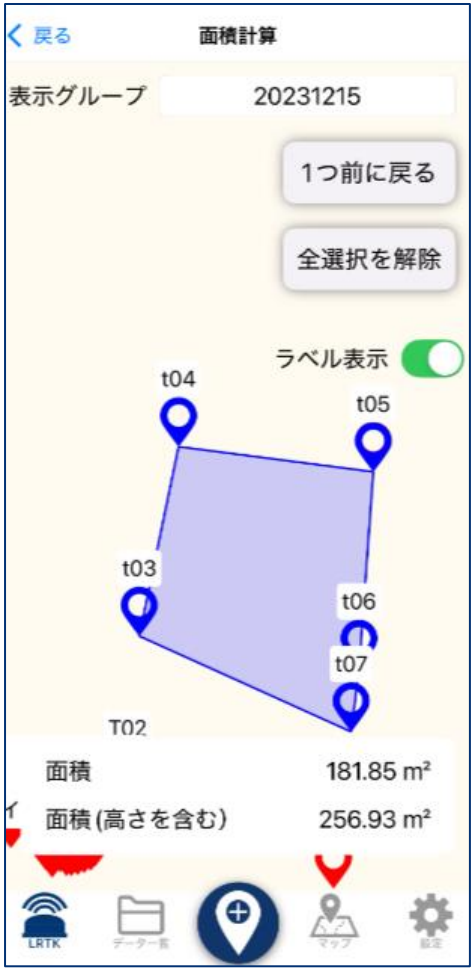
Viewing area in the point cloud viewer



How to find the area from the positioning point

Another way to get the area from multiple positioning points.
You can see both the horizontally projected area and the three-dimensional area.

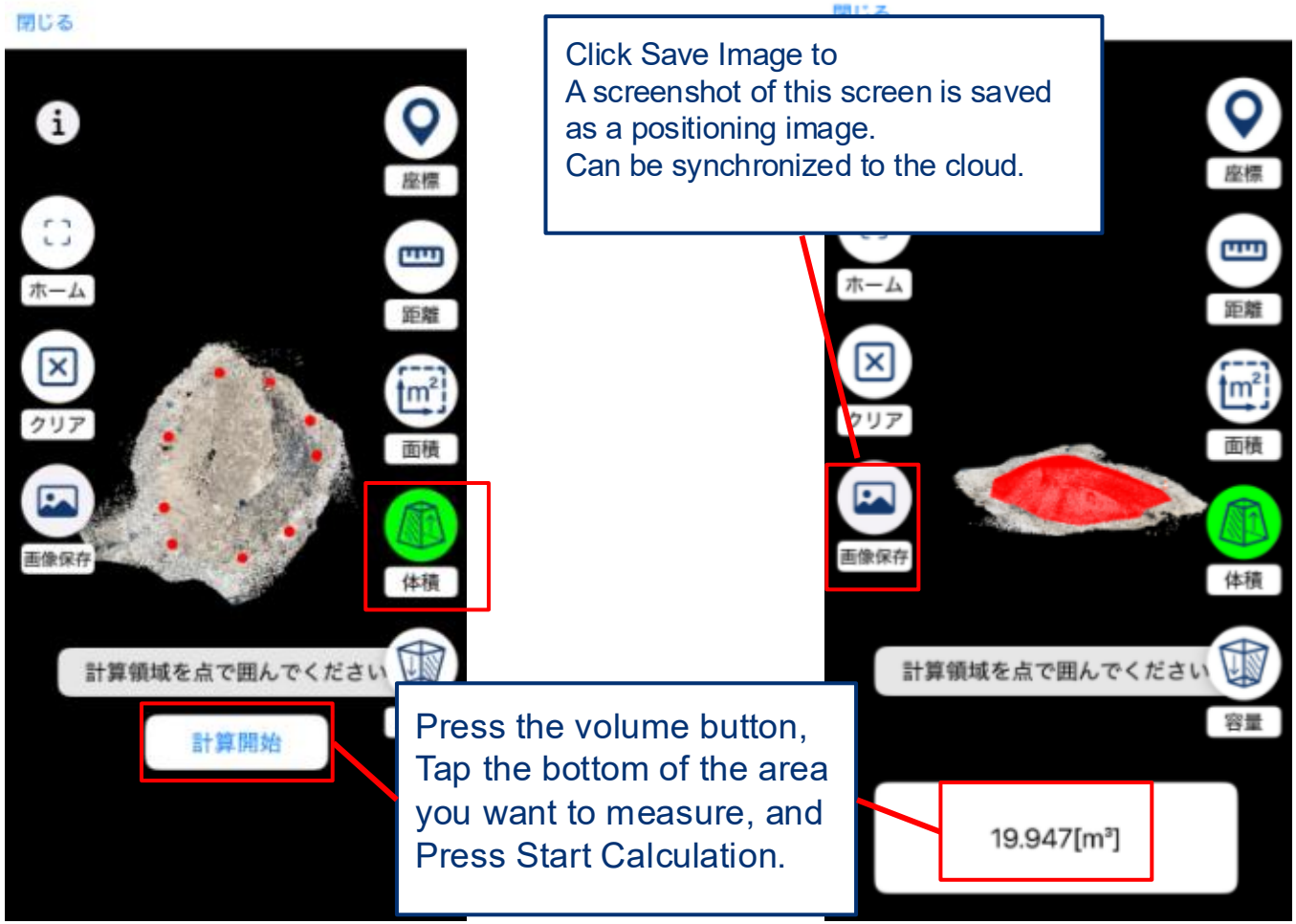
How to find the area from the positioning point



4-5 Find volume/volume at the site

It is possible to obtain volume/volume from point clouds. You can check the point cloud from the data list in the description 1-4. Volume can also be calculated in the same way as explained below.

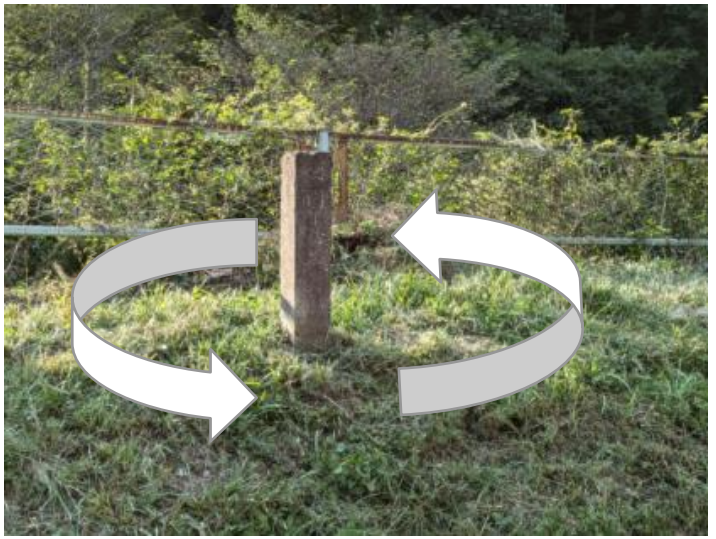
Displaying volume/volume in point cloud viewer



4-6 Want to create high-precision 3D files on site

By using the structure scanning function, you can create high-precision 3D files with absolute coordinates. You can view the created 3D files from the data list.

How to use high-precision scans

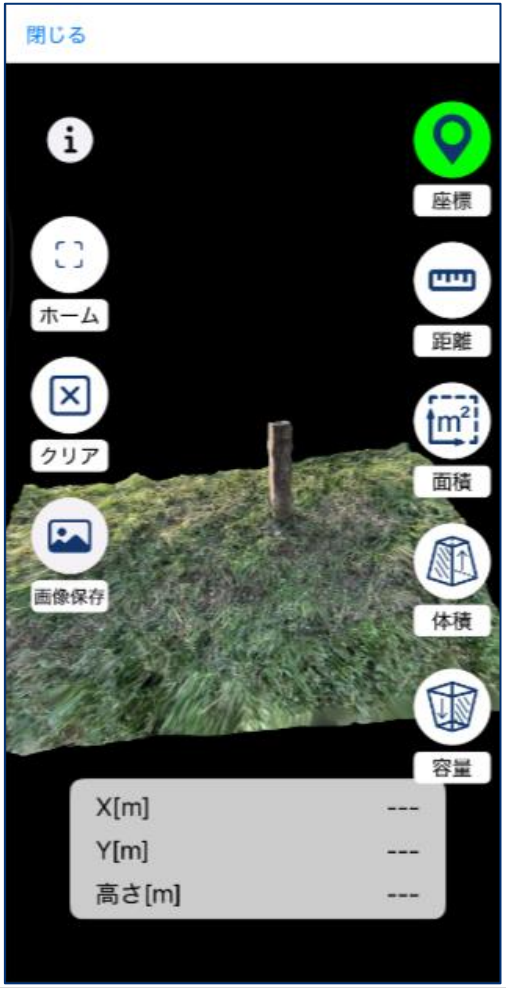


You can use it by pressing Structure Scan and then pressing Start Scan. While scanning, move the camera slowly without concealing it, and take pictures in motion that moves around the object as much as possible. You can create and check 3D files in just a few minutes. If you want to assign absolute coordinates, move at least 6m between the start and end while being fixed.

View files created by Structure Scan

The created 3D files can also be viewed in the cloud through the app.

Created 3D file

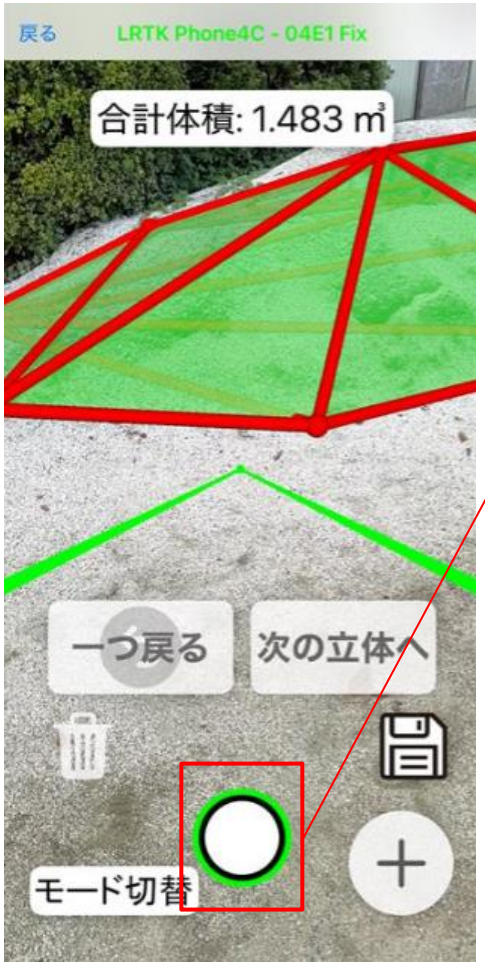


4-7 I want to find a large volume/volume at the site

It is possible to obtain and store large volumes using AR display. You can easily visually obtain the volume by standing up the pins over the area where you want to obtain the volume.

How to find a large volume

Don't hide your camera and walk about 6m with a view.
It is recommended to walk without showing tiles that have the same pattern.



After the directional correction is completed,
Specify the range to cover the area where you want to obtain the volume.
When the line extending in the center is green, you can specify the range with high accuracy.
The specified range is saved as a 3D file with absolute coordinates and can be viewed in the cloud.

5. Measurement in the office

Various measurements and analysis can be performed on the cloud based on the acquired point cloud and positioning points. We will explain how to use it.

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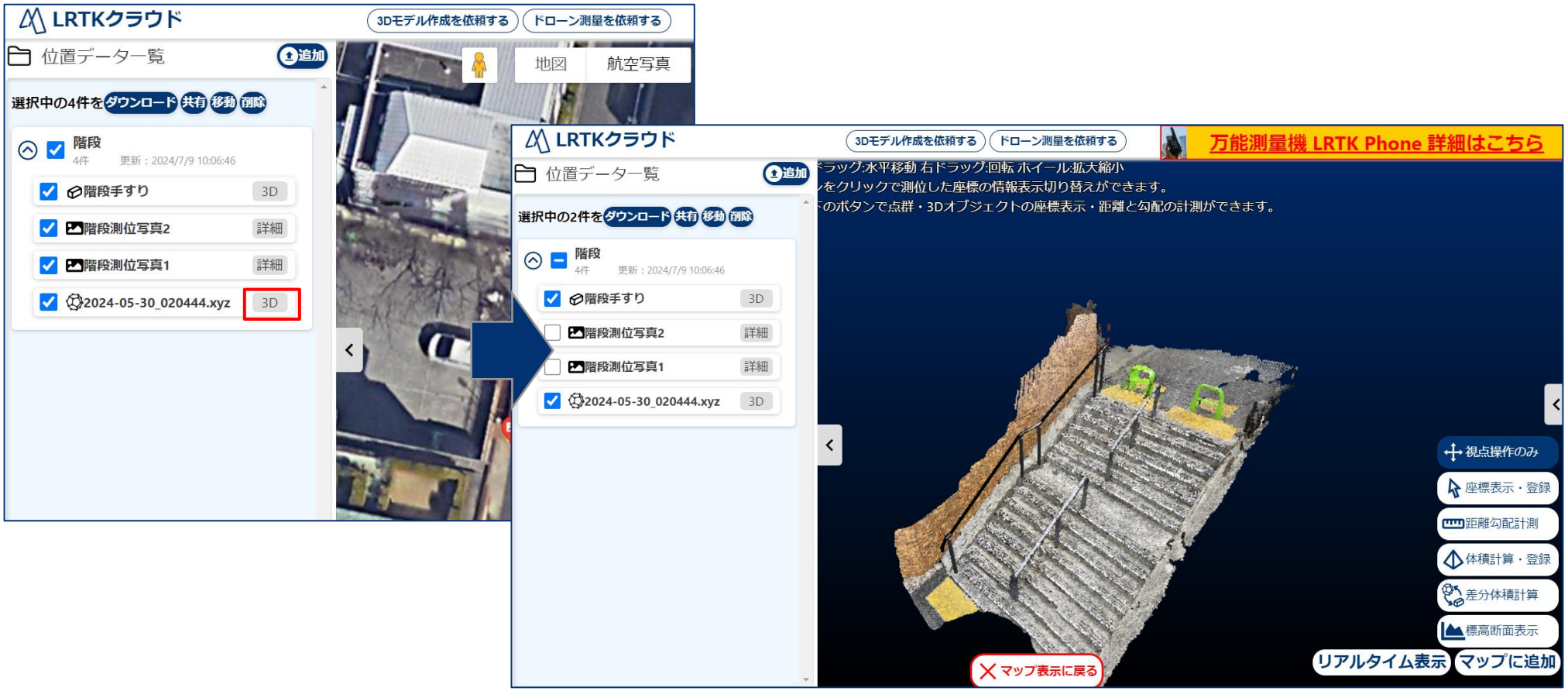
5-1 I want to get absolute coordinates from a point cloud in the cloud

It is possible to register absolute coordinates from the point cloud obtained with the LRTK cloud. After synchronizing the point cloud data to the cloud, press the "3D button" of the point cloud you want to view to display the point cloud.

How to launch the 3D viewer



How to get absolute coordinates from a point cloud

Display coordinates at the bottom right, press the registration button, and click one or more points to which you want to obtain coordinates.Press the registration button to register as positioning data.

How to get absolute coordinates from a point cloud

5-2 I want to calculate distance in the cloud/I want to register a line segment

It is also possible to register the distance from the acquired point cloud. Press the distance gradient measurement at the bottom right and click on both ends of the section you want to measure. Press the registration button to register line data.

How to get the distance

How to find the distance from the positioning point

You can also select two positioning points to obtain the distance. In the map display, press the distance measurement button at the bottom right, and Select two positioning points to display line data. You can register by pressing the registration button.

How to get the distance

5-3 I want to find volume/volume in the cloud

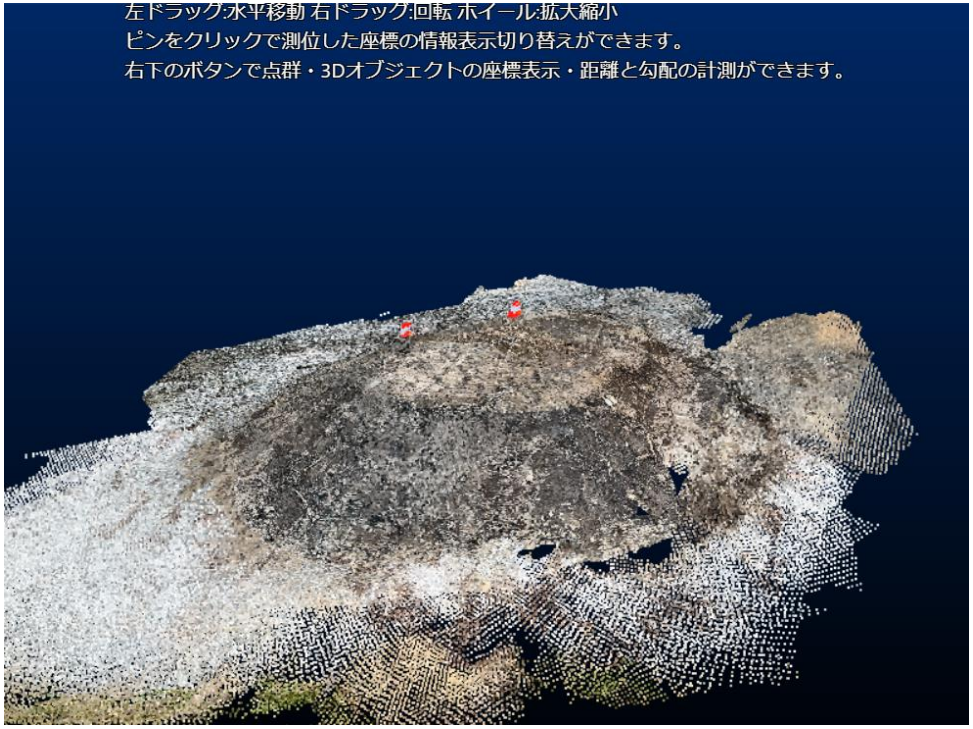
It is possible to obtain volume/volume from the acquired point cloud. Press the Volume Calculation/Register button at the bottom right and click to cover the area you want to measure. Click the registration button to save it.

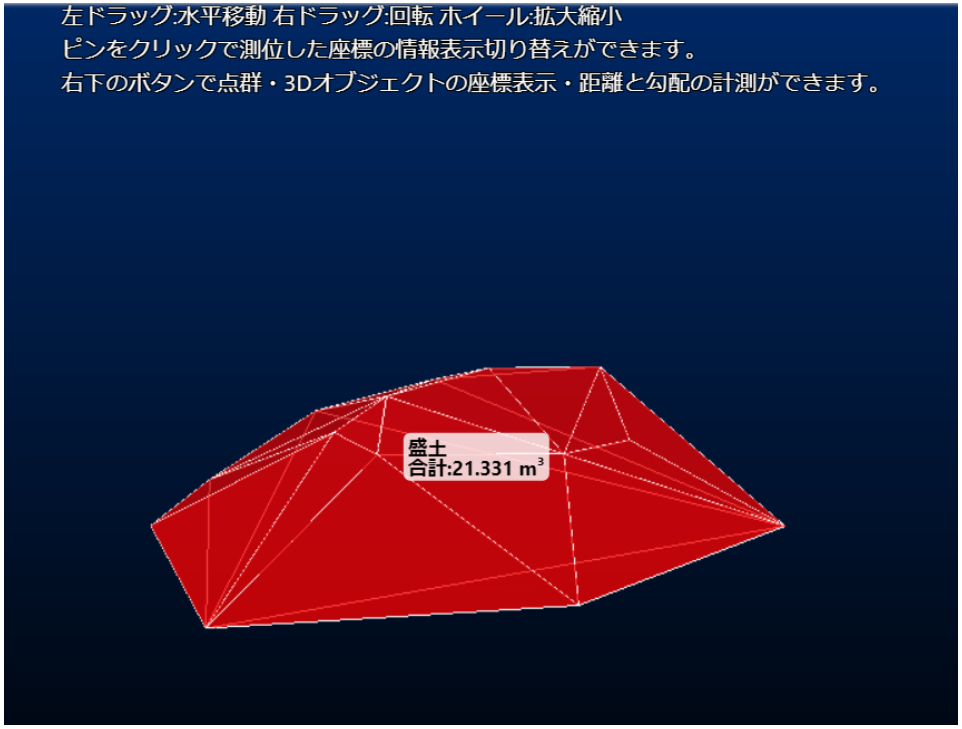
How to obtain volume/volume

About saved volume data

The saved volume data is saved as 3D data with absolute coordinates.
It can also be downloaded as an obj file.

Comparison of point clouds and volume data



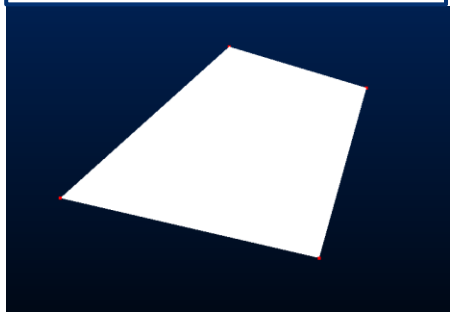


5-4 I want to find the volume of soil mass needed to follow the design plan

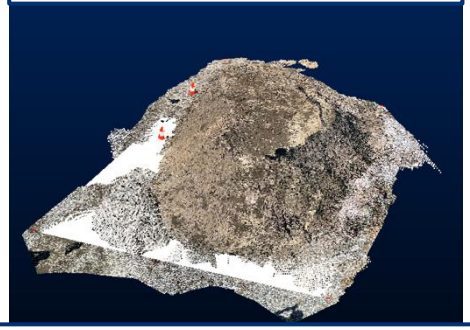
You can view the design drawings and current point clouds and calculate the volume required to follow the design. It can be used for daily progress management, etc.

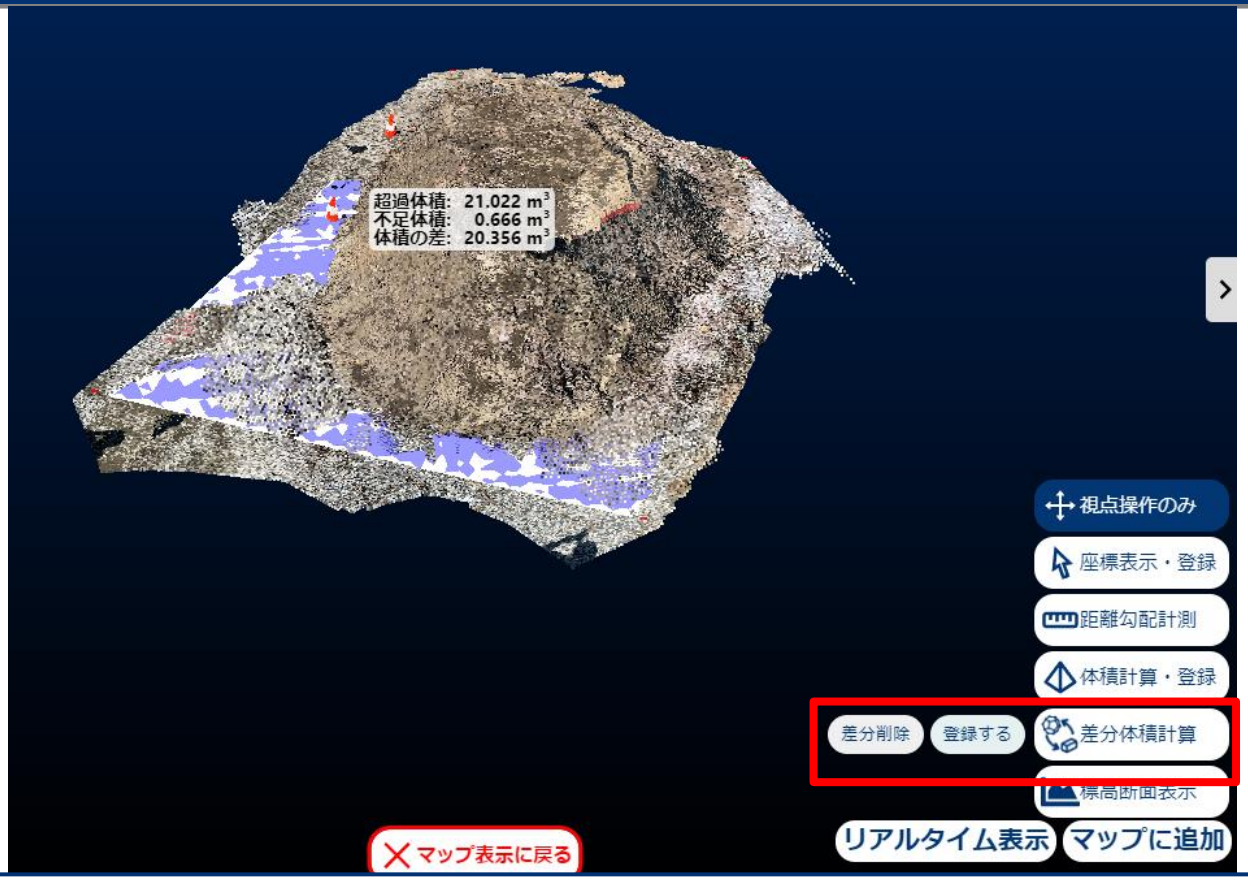
How to obtain soil volume to ensure that it follows the design plan

Plane drawing
(The state to be)



Current situation group





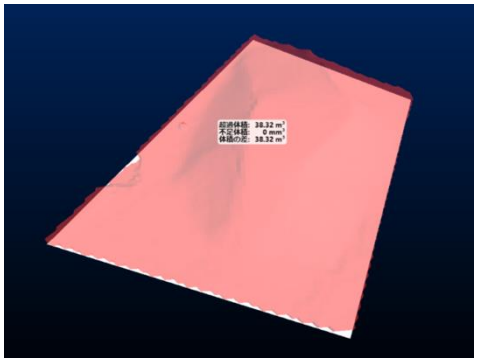
The blueprint (obj file/landXML file added from the cloud) and current point cloud are displayed overlaid, and the difference volume can be automatically calculated by pressing Difference Volume Calculation. You can quickly calculate how much excess or shortage of soil is in order to follow the design plan. Volume data can be saved as an obj file with absolute coordinates.

Elevation correction for volume difference calculations

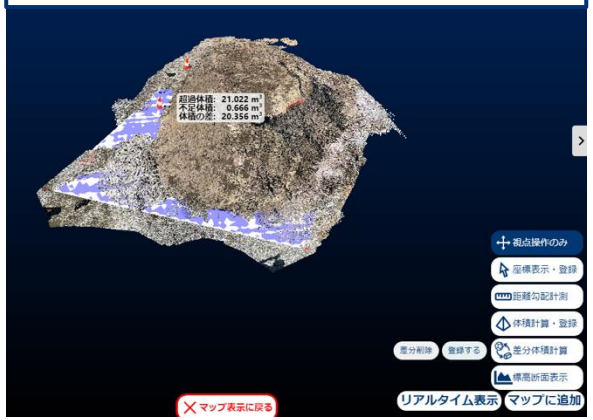
If the difference is shallow over a wide area, even a few centimeters of the point cloud will result in a large volume error. This small height adjustment is possible either automatically or manually.

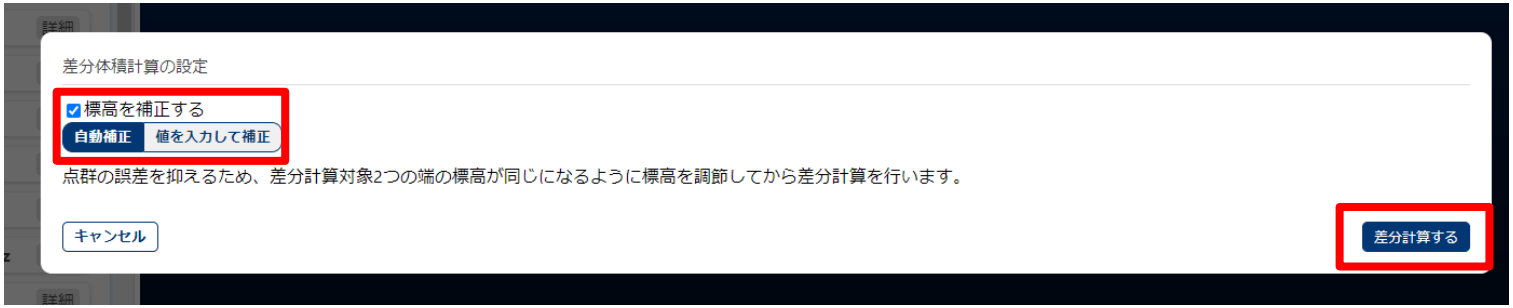
How to correct the elevation

Volume error due to altitude deviation



After correction



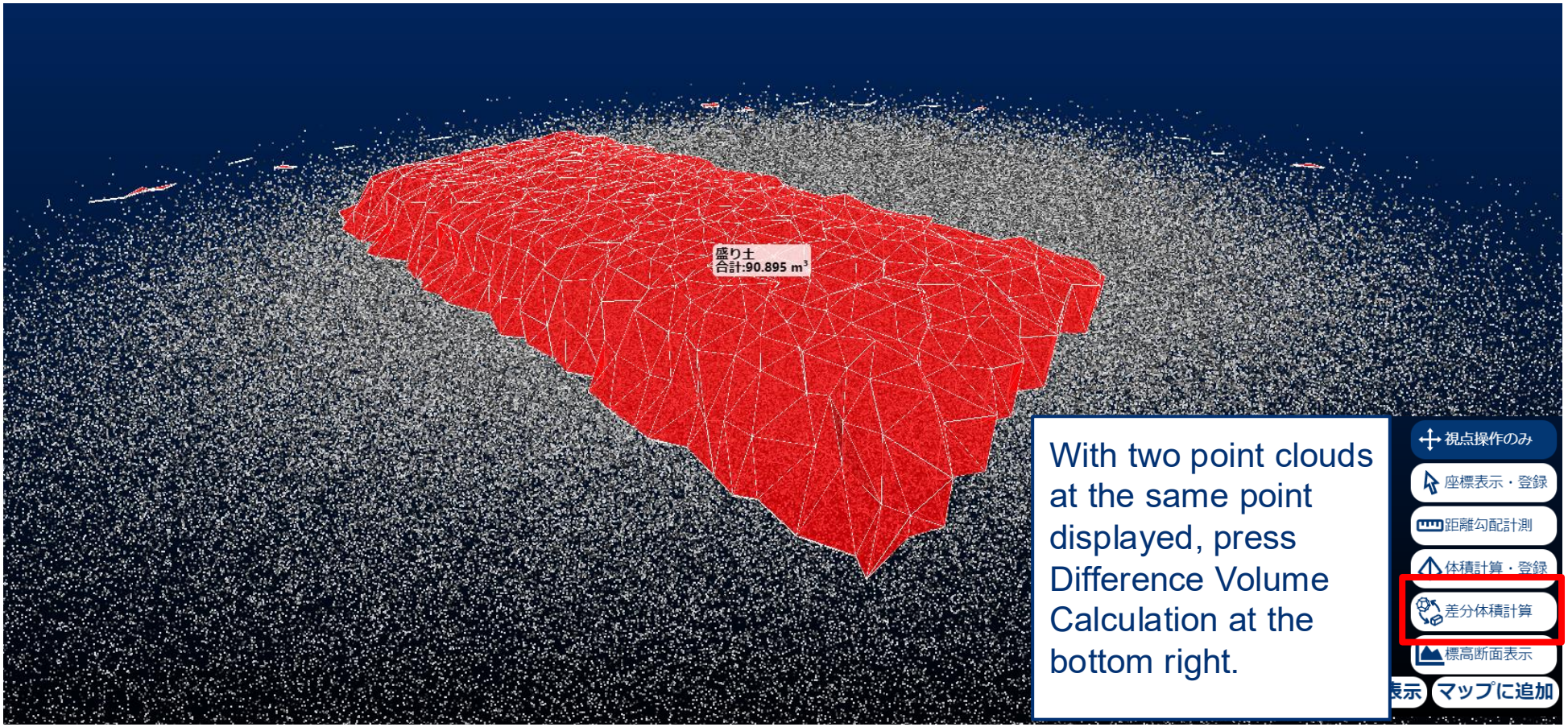


Check the "Comment Elevation when Running Differential Volumes" checkbox and perform elevation correction automatically or manually.

5-5 Comparing past point clouds with current point clouds

It is possible to compare past point clouds with current point clouds and calculation of differential volumes.
By measuring at the end of your daily work, you can use it as a progress management method.

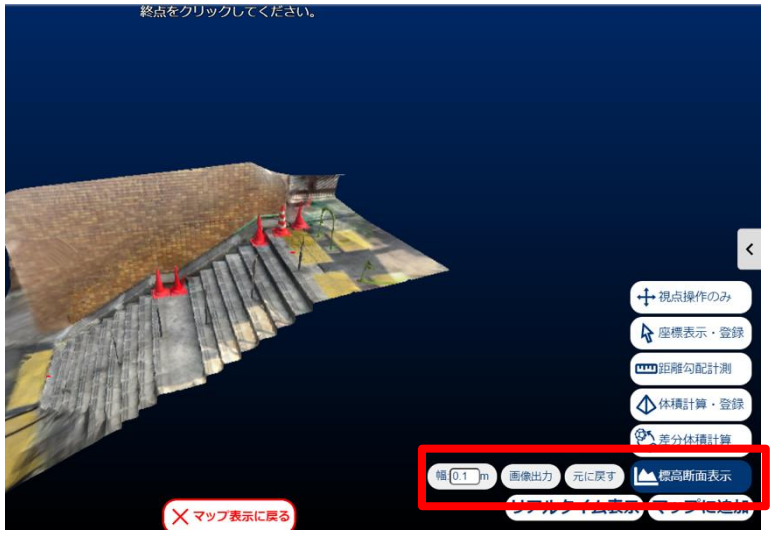
Comparison of past point clouds and current point clouds

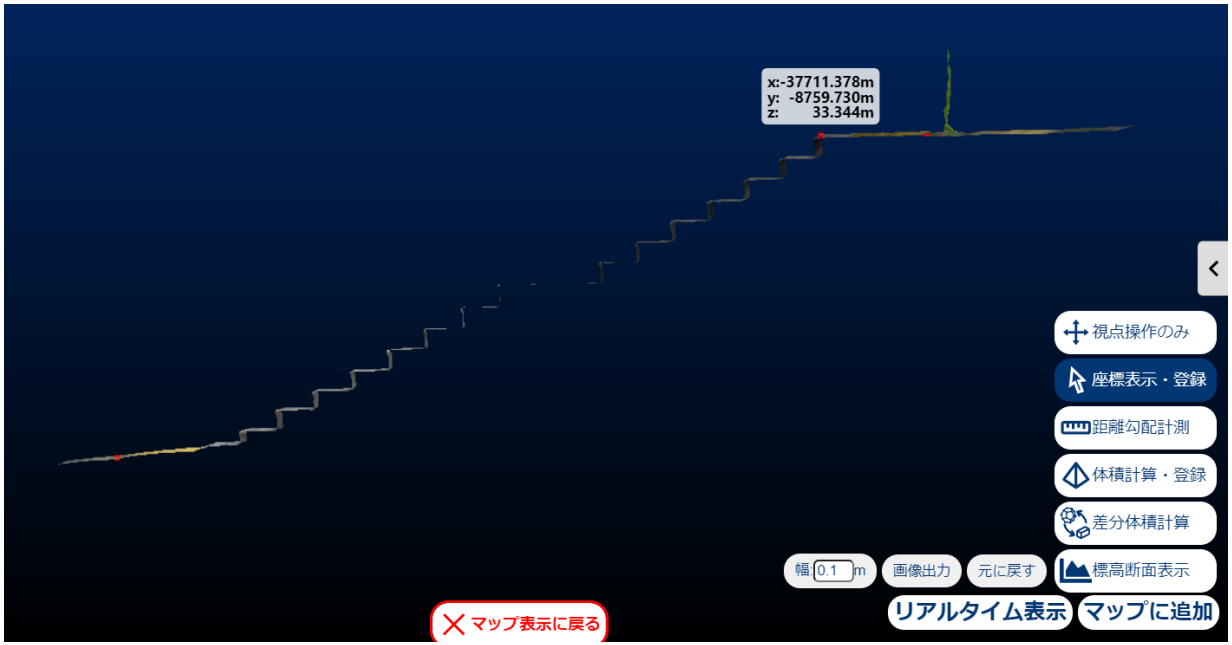


5-6 Check the cross section of a point cloud or 3D file

It is possible to display the cross-section of the acquired point clouds and 3D files. After displaying the section, register the coordinates,By outputting coordinates, you can assist in creating two-dimensional drawings.

Cross-section view of point clouds and 3D files





Press the elevation section display button at the bottom right of the screen and select two points to display a cross section of that section. Coordinates can be registered and distance measurements can be performed even while the cross section is displayed.

5-7 I want to take photos to use for photogrammetry

Photos taken with the LRTK app have high-precision coordinates in the Exif information. Therefore, it can be used with point cloud processing software to create point clouds with absolute coordinates.

Photogrammetry with positioning photos in the LRTK app

*The photogrammetry software you are using must be set to read the coordinates of Exif information.

Continuous shooting function that enables positioning photography functions,
Surrounding objects that are turned into point clouds
Take many photos.

Sync to the cloud
Download in the cloud
(LRTK high-precision coordinates are assigned to the Exif information in the downloaded photo)

Photogrammetry software
The photos obtained on
Put it in and run
(Please refer to the manual for your photogrammetry software.)

6. Share

With LRTK Cloud, almost all measured data can be shared with people. It can be shared even if the recipient is not a user.

6. Share
6-1 I want to share survey results

7. AR display
7-1 I want to share the construction image in AR
7-2 I want to manage the shape using AR display
7-3 I want to display coordinate points in AR display
7-4 I want to display the border in AR display

8. Site drawings and coordinate systems
8-1 I want to display data overlay on the drawings at the site
8-2 I want to create a coordinate system for the site
8-3 I want to display data in the site coordinate system
8-4 I want to upload data in the site coordinate system
8-5 I want to download data in the site coordinate system

6-1 I want to share survey results

Almost any type of data you obtain can be shared with the sharing function. Select the data you want to share and press the share button in the top left. A shared link will be issued.

How to share

Users who receive the shared link can view and download data on the LRTK cloud. It's fine if the user who receives the product does not have 3D viewer software.

How data is visible at the destination

Users to which they are sharing can do all tasks on the LRTK cloud, other than registering data.
Example of shared link: https://lconstruction.lefixea.jp/share/?id=553a67b1-c130-4715-89df-64031330e3c3

7. AR display

Here we will explain how to display AR using LRTK. A 3D file with absolute coordinates
It can be displayed without coordinate adjustment.

6. Share
6-1 I want to share survey results

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7-1 I want to share the construction image in AR

You can share the construction image using the AR display. Displays object files with absolute coordinates in AR without coordinated coordinates. Coordinate adjustment continues automatically during startup.

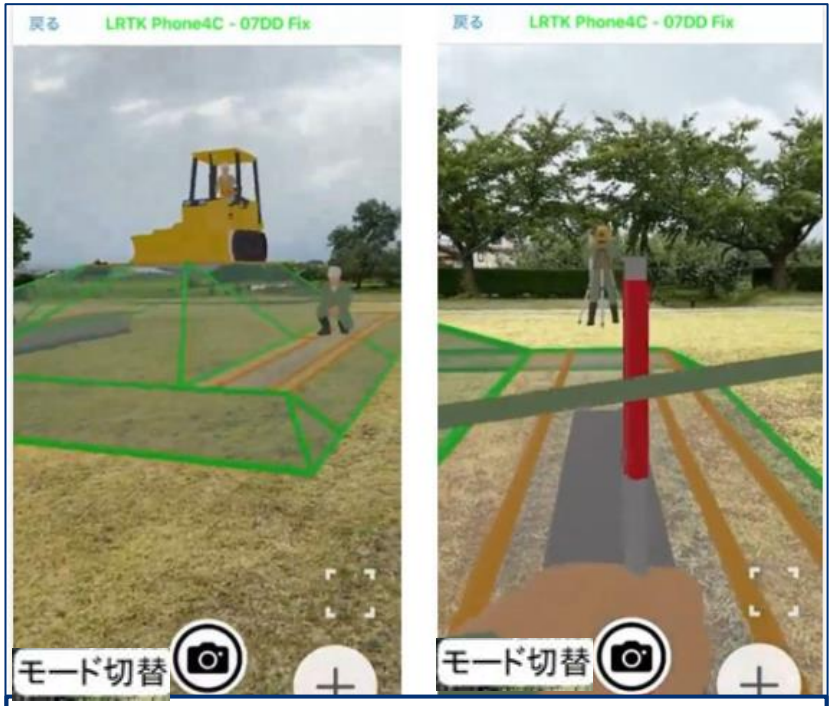
How to share construction images in AR display

Don't hide your camera and walk about 6m with a view.
It is recommended to walk without showing tiles that have the same pattern.

Select the one you want to display from the 3D files with absolute coordinates uploaded in the cloud.

This is the AR display. It is also possible to make objects under the ground semi-transparent. Since it is possible to share the construction image within the client or the installer, there is no rework due to misunderstanding.

How to share construction images in AR display



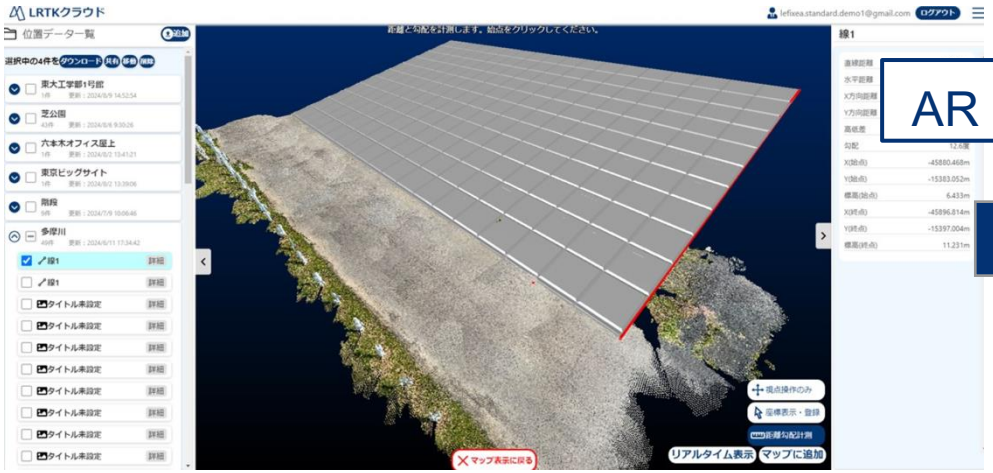
Apparently the scene is displayed in AR. Share images with both clients and installers It's easy. Press the camera mark to take a positioning photo, and you can also save the video to your camera roll (switch mode → screen recording).

You can also change the display settings using the gear mark to make objects under the ground semi-transparent or hidden. By displaying underground reservoir pipes, It can also be used to consider the excavation location.

7-2 I want to manage the form using AR display

By utilizing AR display, you can also manage the finished form. Display the design drawing with absolute coordinates in AR and add/excavate the soil to make it exactly as the drawing.

AR display for construction of the embankment



AR display

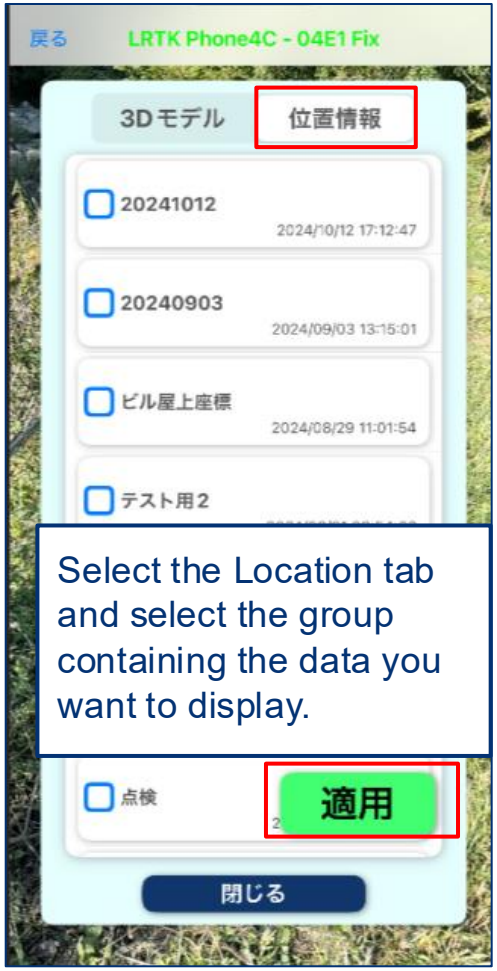
Display the blueprint for the bank in AR. If you carry the soil to the point where the blueprint is no longer visible, you can follow the blueprint.
Work can be carried out on site by checking whether construction is progressing according to the design plan.

7-3 I want to display coordinate points in AR display

You can obtain and display coordinate points while displaying AR. You can also upload the pile driving coordinates of the drawing to the cloud, display them in AR and drive the pile at that point.

Coordinate points display in AR display

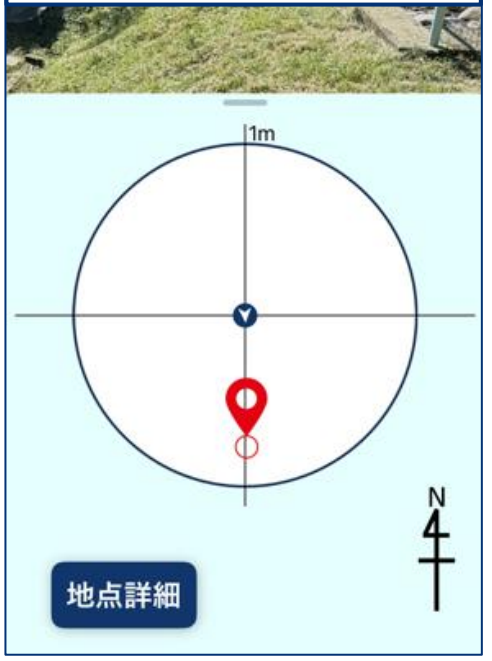
Open the AR function to complete the orientation correction.
Then press the + button at the bottom right.



Select the Location tab and select the group containing the data you want to display.

The coordinate points will be displayed in AR. Also, if we say (mode switch → subject positioning),
You can also store the pins at positioning points one after another.

Press the pin or i button to display coordinate details. There is also a detailed guide screen for the pin, allowing for a smooth transition to precision stakes.



By performing the same operation as in 7-3, line segment data can also be displayed in AR.
It is also possible to acquire line segment data while displaying AR.

Borderline display in AR display

If line segment data is included in the group selected in 7-3, the line segments will also be displayed. If you have entered a boundary point in the cloud, you can view the boundary line.

Select Mode Switch → Distance Measure and tap the pins at the start and end of the point. Line segment data will be registered.

This article explains how to display data overlay with a drawing and how to handle data in drawing coordinates rather than latitude and longitude elevation.

6. Share
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8-5 I want to download data in the site coordinate system

8-1 I want to display data overlay with the drawings from the site

With LRTK cloud, you can display site drawings overlaid on a map. This makes it clear where the acquired data falls on the drawing.

How to stack site drawings on a map

Select Add in the top left of the screen → Overlay drawing image on googlemap. Select a drawing image with the north facing up. Click two points on the map that appears and enter its latitude and longitude. Press the Overlay button to register the drawing and display it on the map. We will also be developing a function to register dxf and dwg drawings with absolute coordinates in the future.

8-2 I want to create a coordinate system for the site

The coordinates obtained with LRTK are absolute coordinates, but by registering the site coordinate system, you can input/output/display the site coordinate system coordinate values.

Absolute and site coordinates

Coordinate values of plane perpendicular coordinate systems. The latitude and longitude elevation obtained with GNSS is the absolute coordinate value.
The numbers are big and difficult to handle.

Localization
Associate with

Coordinate values in the coordinate system set for each site. Design drawings are generally written in site coordinate systems.

The site coordinate system is registered by manually associating the absolute coordinate values with the site coordinate system for three or more points. From then on, survey values can be handled in the site coordinate system. (Localization)

How to create site coordinate systems

We use three points that know both the absolute coordinates and the value in the site coordinates, and register the site coordinate system. After registration, you can input/output/display coordinate values for the site coordinate system.

How to create a site coordinate system

The coordinate system is registered using three or more points with known values in both the absolute coordinates and the site coordinate system.
① Register the absolute coordinates of the absolute coordinates of the positioning point by inputting LRTK positioning/csv etc. (See 10-3)
② Positioning points to use to create coordinate systems Check the three or more points and press the Create coordinate system button. (Upper left frame in upper left diagram)
③ Enter the value in the site coordinate system for each point in [m] units. (Right frame in upper left image)
④ Coordinate conversion errors will be displayed, so if there are no problems with coordinate conversion, please press the registration button. (top right)

*You can select whether the input coordinate system is a mathematical coordinate system or a survey coordinate system. A typical drawing is a mathematical coordinate system.

It is possible to display coordinate values in the created coordinate system on the LRTK cloud.

How to view coordinates in the site coordinate system

1. Press Display Settings.

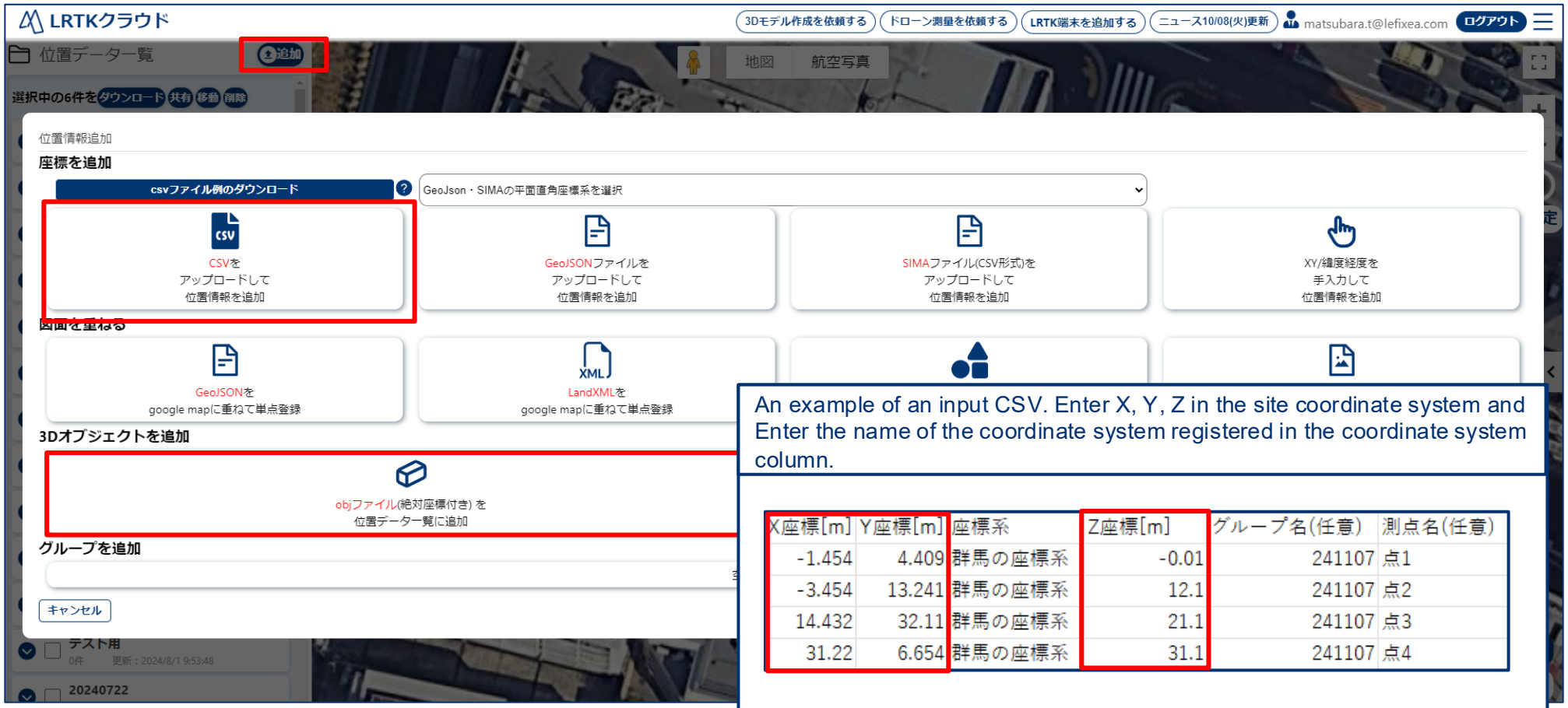
② Select from the registered coordinate system.

③ Displays such as pop-ups become site coordinate values.

8-4 I want to upload data in the site coordinate system

It is also possible to upload CSVs containing the site coordinate system values, or OBJ files created with the site coordinate system to the cloud.

How to enter data in the site coordinate system



An example of an input CSV. Enter X, Y, Z in the site coordinate system and Enter the name of the coordinate system registered in the coordinate system column.

X座標[m]	Y座標[m]	座標系	Z座標[m]	グループ名(任意)	測点名(任意)
-1.454	4.409	群馬の座標系	-0.01	241107	点1
-3.454	13.241	群馬の座標系	12.1	241107	点2
14.432	32.11	群馬の座標系	21.1	241107	点3
31.22	6.654	群馬の座標系	31.1	241107	点4

8-5 I want to download data in the site coordinate system

Check the data you want to download and press the download button in the top left.
By selecting the output coordinate system, the output will be output as values in the field coordinate system rather than the absolute coordinates.

How to output data in the site coordinate system

*The site coordinate values can be output using the csv/sima/point cloud file/obj file.

9. Positioning in various environments

LRTK also allows positioning in difficult environments. Here we will explain how to do this.

9. Positioning in various environments
9-1 I want to perform high-precision positioning outside of smartphone range
9-2 I want to perform positioning indoors
9-3 I want to position where I can't reach or where I am not allowed to enter

10. Data input/output and editing
10-1 I want to upload a 3D file
10-2 I want to upload coordinate points to the cloud
10-3 I want to upload boundary coordinates to the cloud
10-4 I want to download the positioning results
10-5 I want to rename/delete/move group data

9-1 I want to take high-precision positioning outside of smartphone range

The network RTK you normally use must be connected to the Internet. LRTK allows for high-precision positioning using satellite Michibiki, even in the mountains outside the Internet.

How to use high-precision positioning outside of smartphone range

Attach the out-of-range antenna that comes with the starter kit and press the CLAS button in the app.
Wait for about 3 minutes where the sky is open and you'll get Float and Fix.
About CLAS Accuracy: https://qzss.go.jp/technical/system/l6.html

Generally, GPS positioning requires an open sky. LRTK allows you to obtain coordinates indoors such as under bridges.

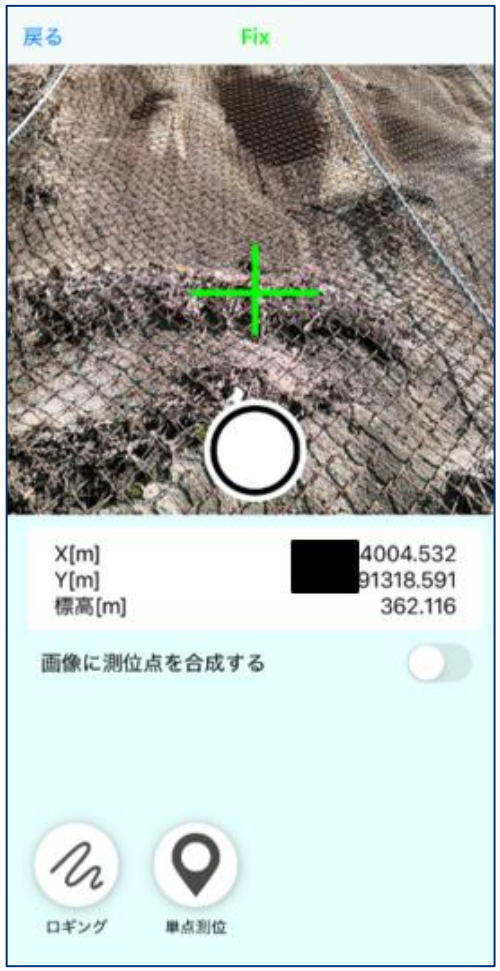
How to position indoors

Don't hide your camera and walk around the outdoors about 6m with a view. It is recommended to walk without showing tiles that have the same pattern. Once the directional correction is complete, positioning can be performed indoors, and data can be acquired and viewed in the cloud. An error of about 3% will accumulate in relation to the distance traveled indoors.

9-3 I want to position where you can't reach or where you cannot enter

By using the subject positioning function, you can position where you are out of reach.

Subject positioning function



Example of obtaining plumbing coordinates for slopes

Set the point where you want to obtain the coordinates as the center of the cross in the center of the screen,
Please press the shooting button. The coordinate accuracy is expressed in cross colors, and is green, yellow, and gray in order of highest order.
Positioning can be performed from iPhone to 6m.

LRTK allows you to upload various types of data and use it in the app. Also, much of the measurement data can be downloaded. Here we will explain how to use it.

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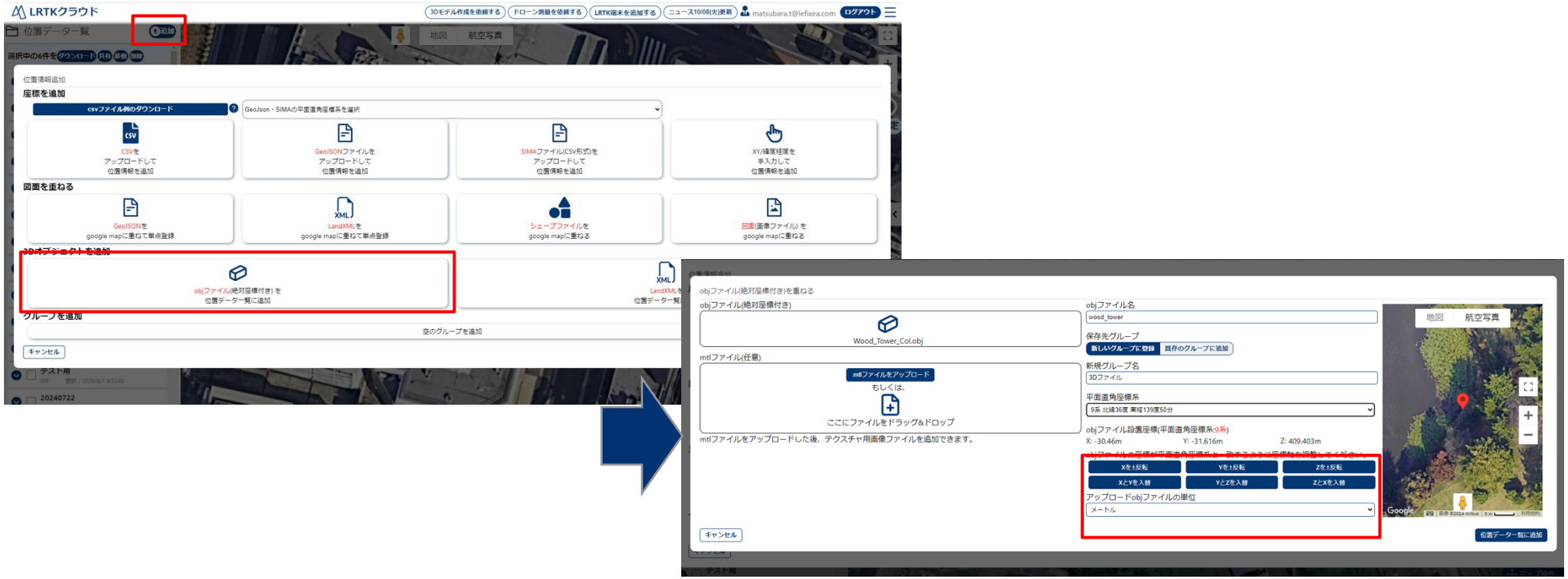
You can upload obj files and landXML files with absolute coordinates from the LRTK cloud. 3D files can be displayed in the cloud overlay or in AR.

How to upload a 3D file

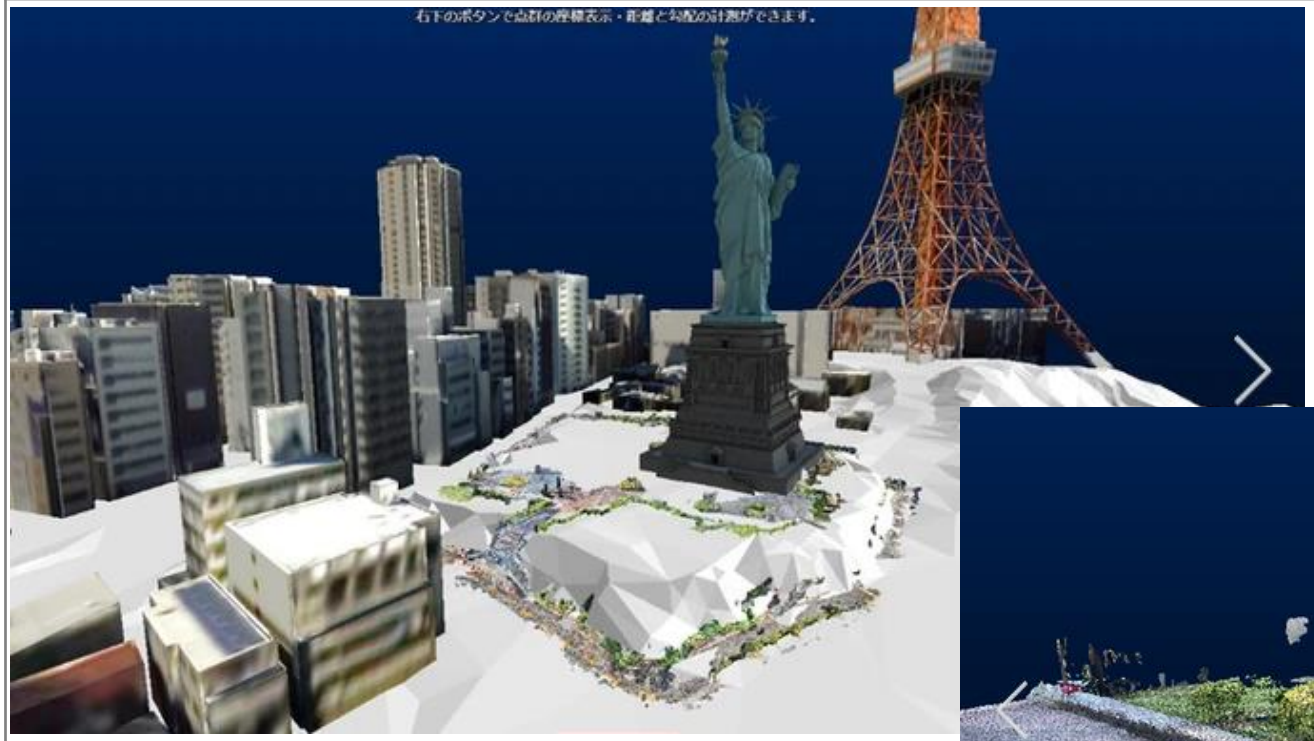


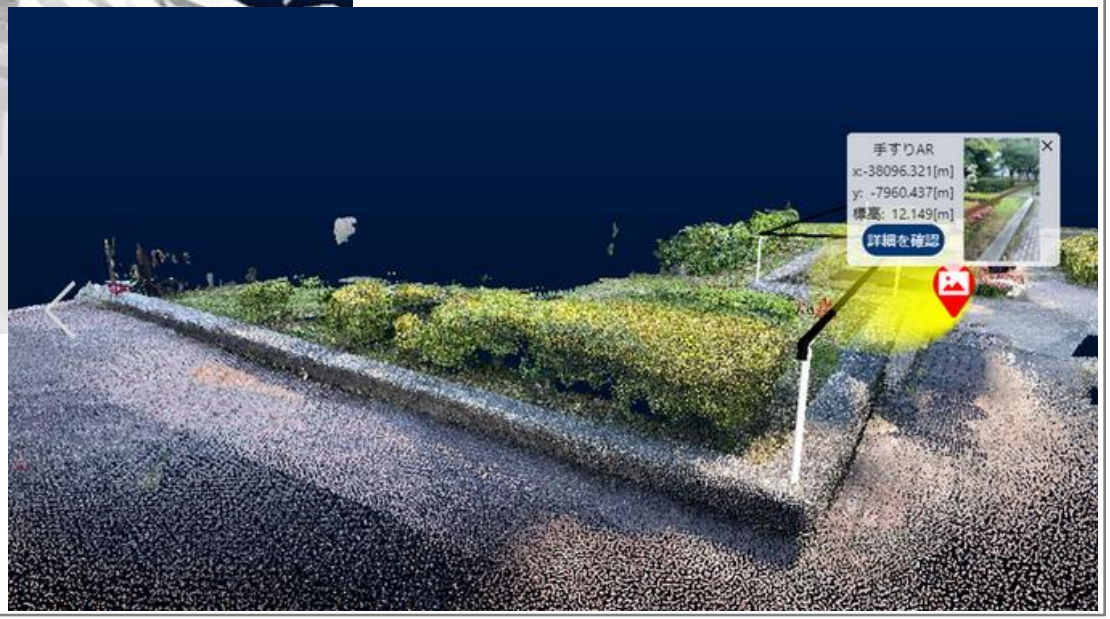
Select Add obj file from the Add button on the top left of the screen and register the obj file with absolute coordinates. You can change the coordinate axes on the registration screen. Obj files output in mathematical coordinate systems can be registered as is. Please set the axis so that it is located in the correct location while looking at the map. LandXML can also be registered in the same way.
It is also possible to upload an obj file created in the site coordinate system created in 8-2.

Uploaded 3D files

Uploaded 3D files are registered in the cloud and can be displayed overlaid with a point cloud. It is also possible to display city and topographic data from PLATEAU.

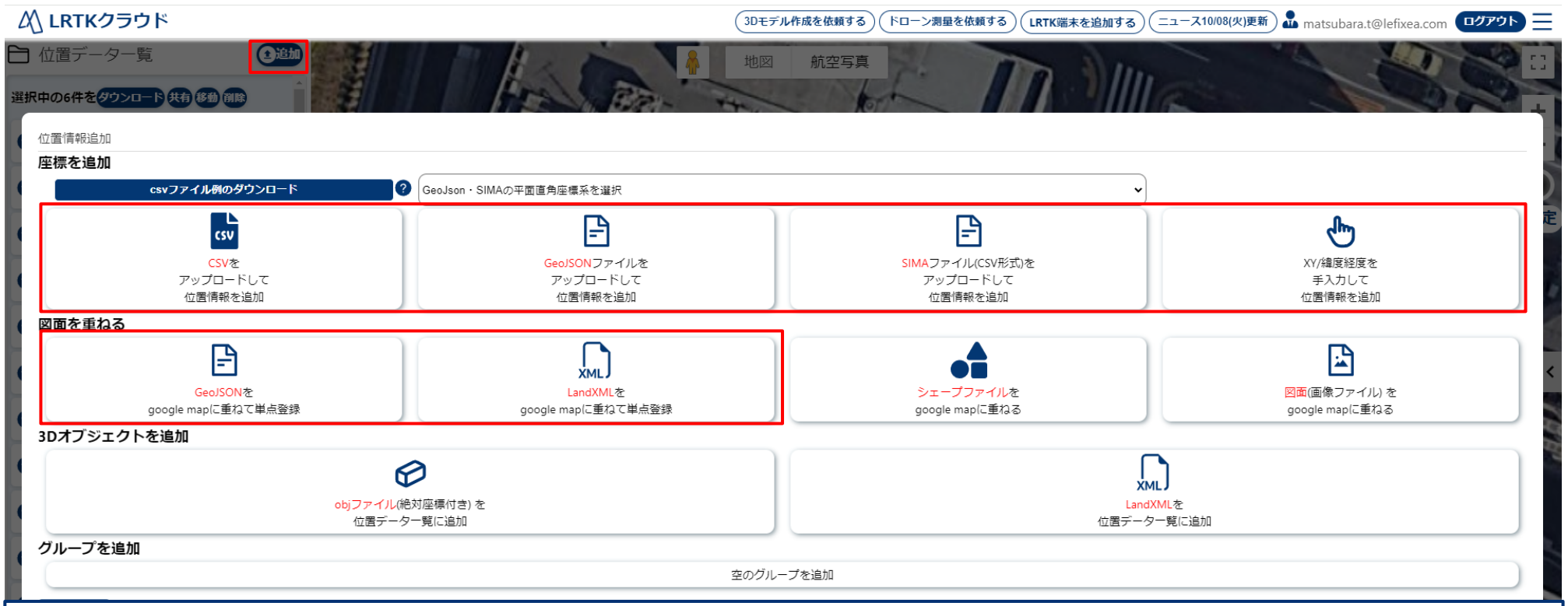
Viewing in the cloud





You can also upload the coordinates of the reference point and coordinates surveyed with TS to the cloud. Uploaded coordinate points can be used for localization and coordinate derivation.

How to upload coordinate points

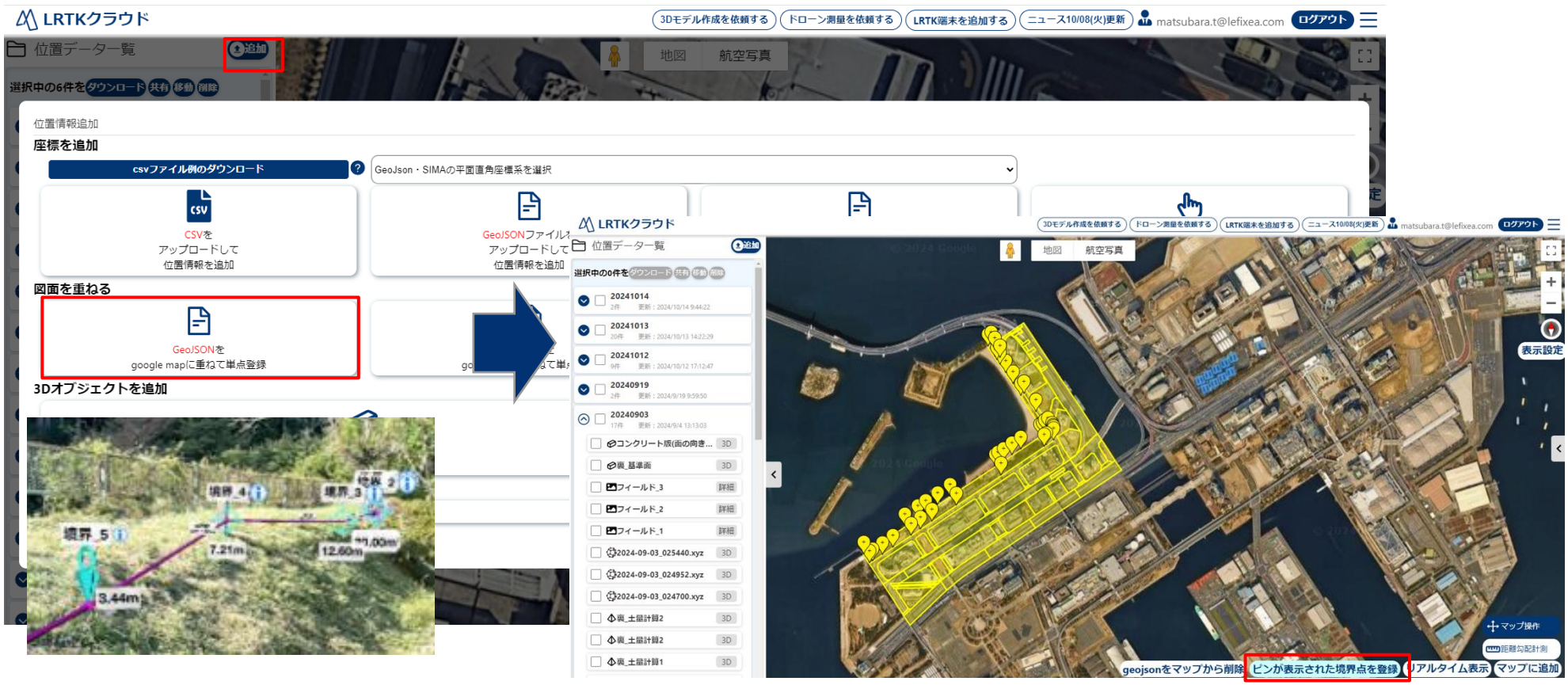


You can upload coordinate points in the format csv/sima/Manual Input/GeoJSON/landXML by pressing the add button on the top left of the screen. For the CSV format, please use the example downloadable.

10-3 I want to upload boundary coordinates to the cloud

You can register coordinate points from the land boundary GeoJSON, which is registered at G Spatial Information Center, etc. It can be used to direct coordinates to a boundary point or to display the boundary line.

How to upload boundary coordinates



Press the add button on the top left of the screen, overlap GeoJSON and press single point registration. Click on the displayed area to register a pin appears at the boundary coordinates of the area.

Most data that can be viewed in the cloud is available for download. Check the data you want to download and press the download in the top left of the screen.

How to download

The person you share with using the shared link can also be downloaded, allowing for smooth data transfer.

Many types of data can be renamed/delete/moved grouped.

How to change/delete/move group

The coordinate point name can be changed from the top of the detailed display screen. Check the data and press the button to delete and move it. Data deleted in the cloud will also be deleted from the app when synced with the app. please note.

Q&A

LRTK Point Cloud Scan Manual I want to obtain point clouds with accuracy. A solution to obtain a cleaner point cloud.

Lefixea Inc.

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電話:03-6456-4323
URL:https://lefixea.com

Three point cloud scan techniques exist

- Point cloud scan
- Advantages: Point cloud scans can be performed using only smartphones
- Volume calculation can be done immediately on the spot
- Disadvantages: Lidar required, distance up to 8m

- Detailed Point Cloud Scan
- Benefits: The most beautiful and wide range of points can be obtained
- No need for lidar, working without flight distance limit
- Disadvantages: Server analysis takes time
- Volume calculation cannot be performed using a smartphone (can be done in the cloud)

- Structure scan
- Advantages: 3D scans can be done using only smartphones
- You can get 3D models with textures (photos)
- Accessed buried pipes and other items can be displayed as is
- Disadvantages: The measurement range is narrow

LRTK: Point Cloud Scan Manual

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- Disadvantages: The measurement range is narrow

Point Cloud Scan: Where to Use

The point cloud scan function allows you to acquire point clouds for medium to large areas, allowing you to check data immediately at the site. Used when you want to measure the height, area, and volume of embankments and topography.

Fill and volume obtained using the point cloud scan function

Point Cloud Scan: How to Use

When scanning a point cloud, you can perform the calculation of volume, etc. without any problems by setting the acquired point cloud density to "medium density or higher." You can scan the object while overlapping it with the background.

How to use point cloud scans

Press Point Cloud Scan.

For point clouds used for volume calculations, the point cloud density obtained is sufficient to be "medium".

Do a scan.
6m between start and end
Please walk more. The point clouds obtained during this time will also be given absolute coordinates.

Once the acquisition is complete,
Press the check button at the bottom right.

Point cloud scan: Tips for how to use 1

You can obtain accurately by holding the LRTK Phone in a positive (parallel) position to the object you want to acquire, with a positive angle of 30 degrees.

Point Cloud Scan: Tips for Using

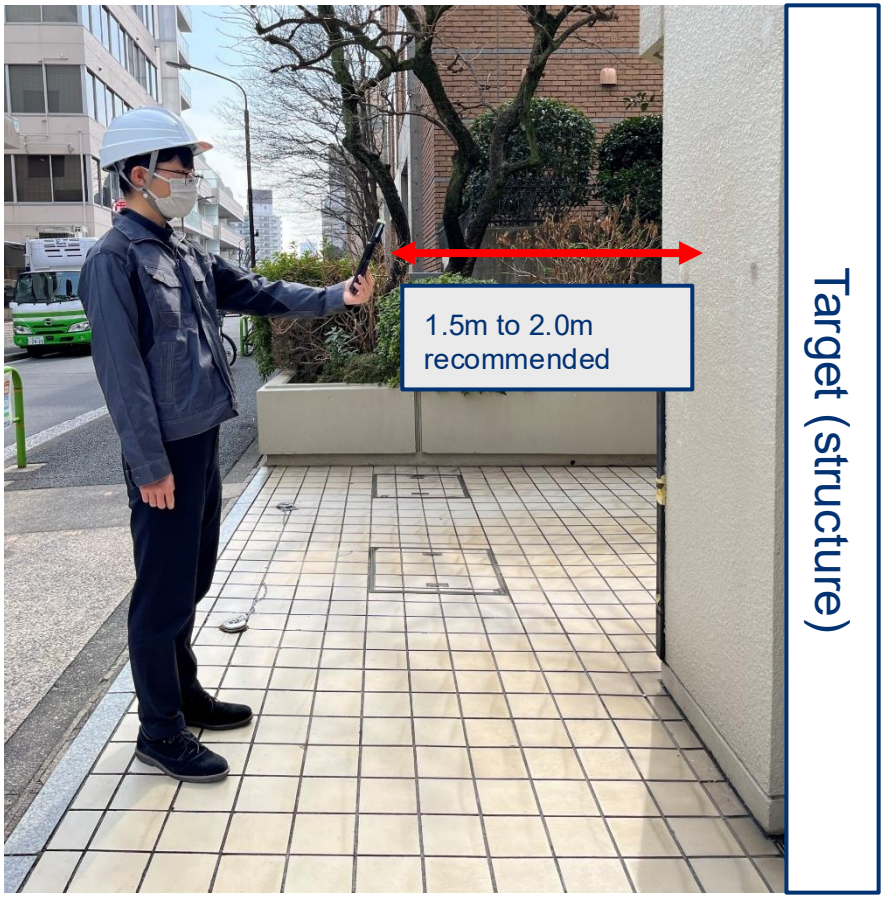
○Good example
Parallel to the ground within 30°

×Bad example
Over 30° to the ground

Point Cloud Scan: Tips for Using ②

If you set the ground or wall you want to measure as closely as possible, leave the distance 1.5 to 2.0m apart, and secure your arms and elbows at about 30 degrees without moving them, you can scan without any distortion.

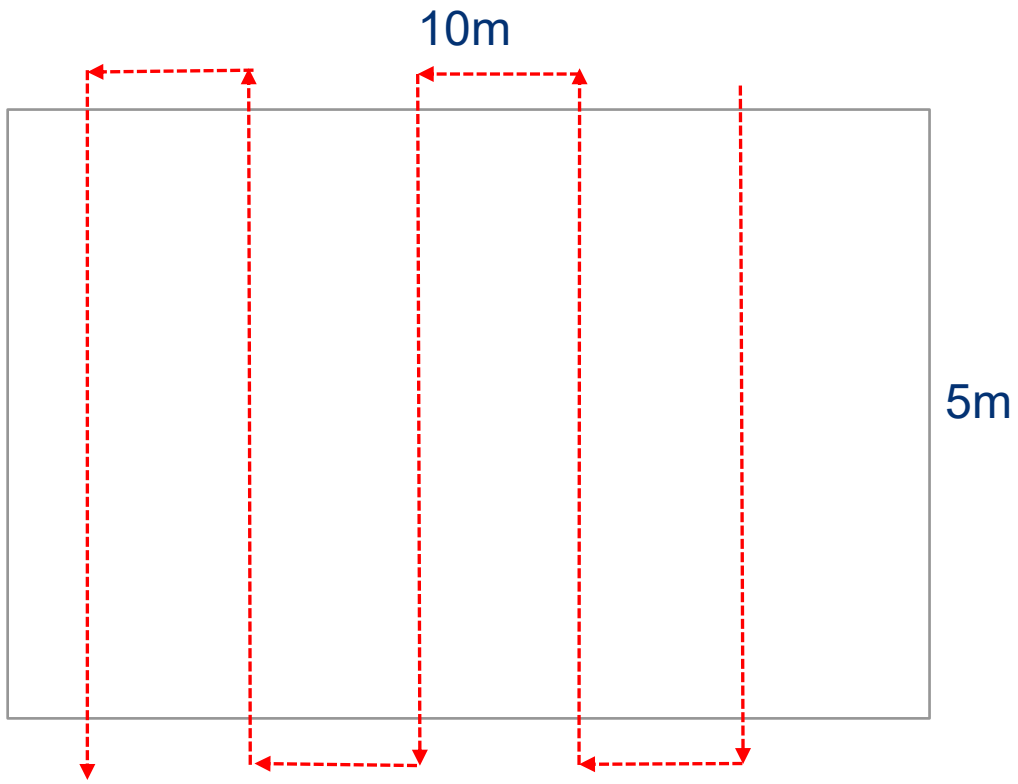
Point Cloud Scan: Tips for Using



Point cloud scan: Tips for how to use it 3

Try to move forward and avoid retreating or moving sideways as much as possible. Scan in a single stroke and do not take the same place multiple times. When moving sideways, it is better to get it by walking around crab.

Point Cloud Scan: Tips for Using



How to walk when taking the ground

Measurement route

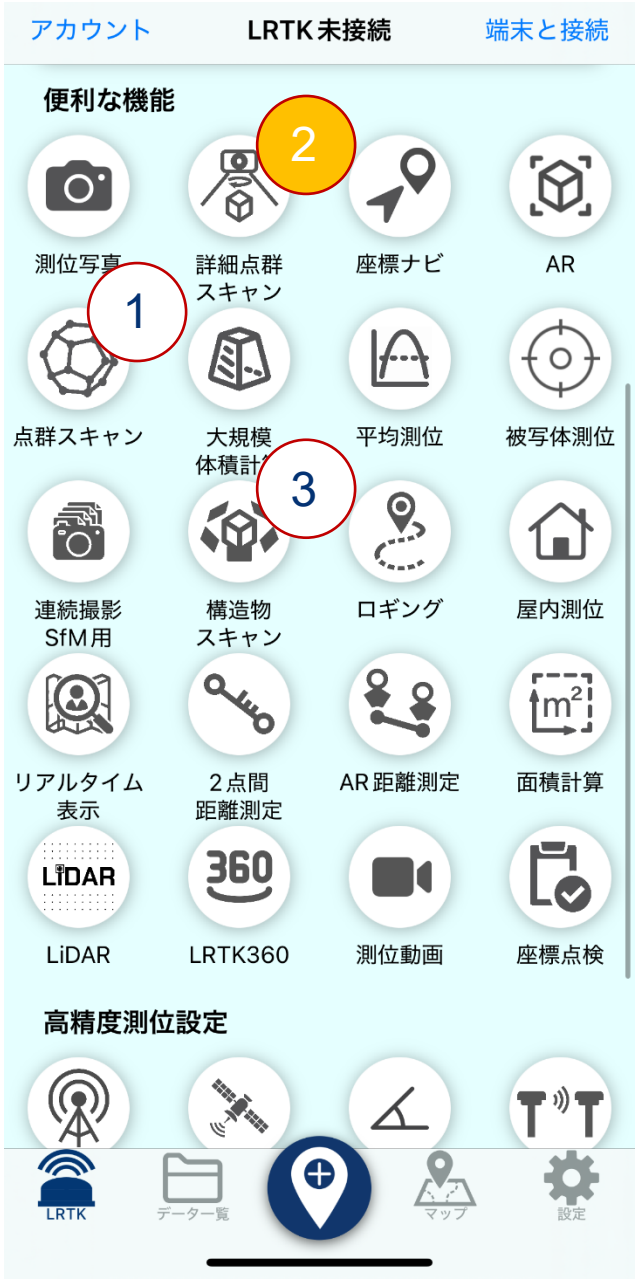
How to walk when taking a slope (crab walk)

Three point cloud scan techniques exist

- Point cloud scan
- Advantages: Point cloud scans can be performed using only smartphones
- Volume calculation can be done immediately on the spot
- Disadvantages: Lidar required, distance up to 8m

- Detailed Point Cloud Scan
- Benefits: The most beautiful and wide range of points can be obtained
- No need for lidar, working without flight distance limit
- Disadvantages: Server analysis takes time
- Volume calculation cannot be performed using a smartphone (can be done in the cloud)

- Structure scan
- Advantages: 3D scans can be done using only smartphones
- You can get 3D models with textures (photos)
- Accessed buried pipes and other items can be displayed as is
- Disadvantages: The measurement range is narrow



Detailed Point Cloud Scans allow you to get the widest and most accurate point clouds. Since the server processes and generates point clouds, it is useful when obtaining highly accurate point clouds even if it takes time.

Detailed Point Cloud Scan: Where to Use

Highly accurate point clouds obtained through detailed point cloud scans

Detailed Point Cloud Scan: How to Use

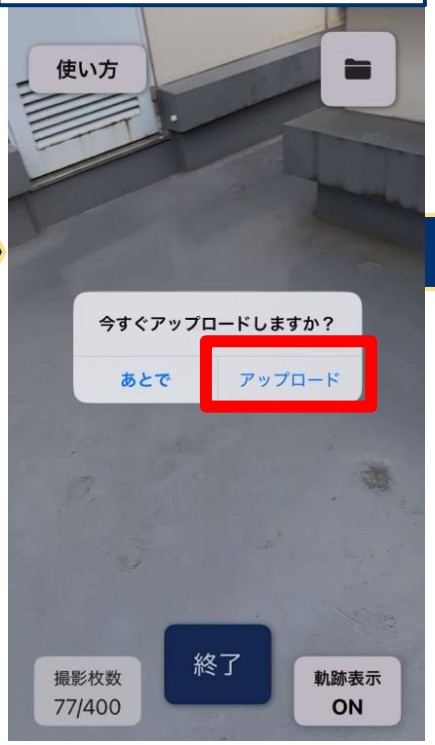
Detailed Point Cloud Scan generates point clouds by taking a photograph of the object and uploading a photo. The generated point cloud is automatically registered in the cloud.

How to use detailed point cloud scans

Press Details Point Cloud Scan.

Press the start button to start shooting.
Filming is done automatically.

Press the end button
The photographs you took will be uploaded and the processing will begin in the cloud.



The point cloud is usually registered in the LRTK cloud in about 3 hours.

"Adjust the entire object to fit within the angle of view, and move the camera slowly and smoothly while scanning. Slow movement and shaking can cause distortion.

Detailed Point Cloud Scan: Tips for Using

*For objects that cannot be rotated, such as slopes, it is recommended to take photos while walking around crabs.

Scan to circumvent the object

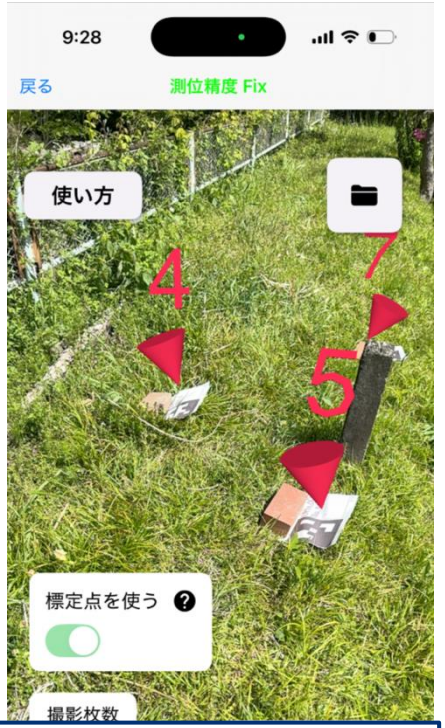
Completed drawing

How to use the alignment point

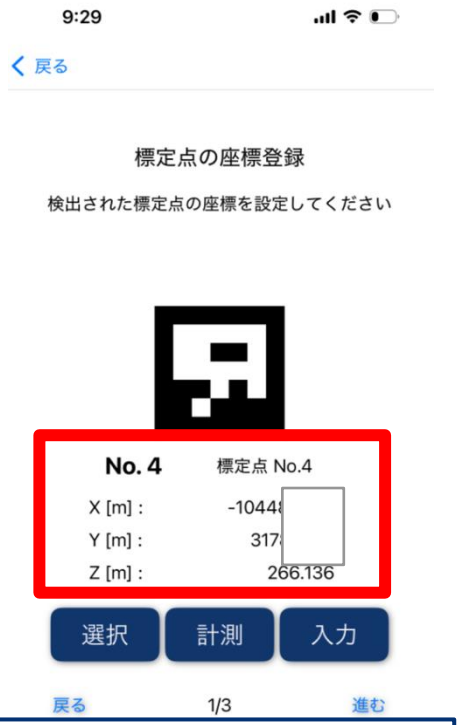
You can download the orientation point from the button above the LRTK cloud. By printing and using it, Improves absolute coordinate accuracy for point clouds generated by detailed point cloud scans.

How to use the alignment point

Surrounding the object
Please place a fixed point.
Turn on Use Orientation Point and start.



When the orientation point is recognized,
You will see a mark similar to the one shown in the image.



When uploading the image,
You can input/measure the absolute coordinates of each orientation point.

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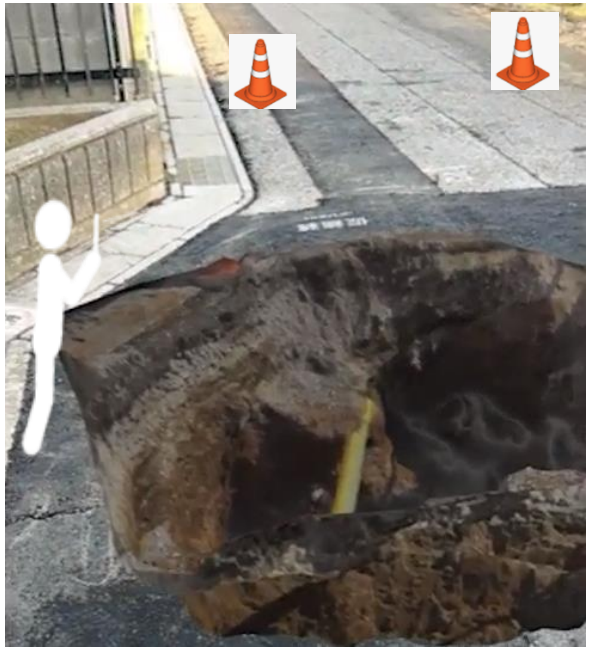
- Structure scan
- Advantages: Point cloud scans can be performed using only smartphones
  - You can obtain 3D models with textures (photos)
- You can display the acquired buried pipes and other items as they are.
- Disadvantages: The measurement range is narrow

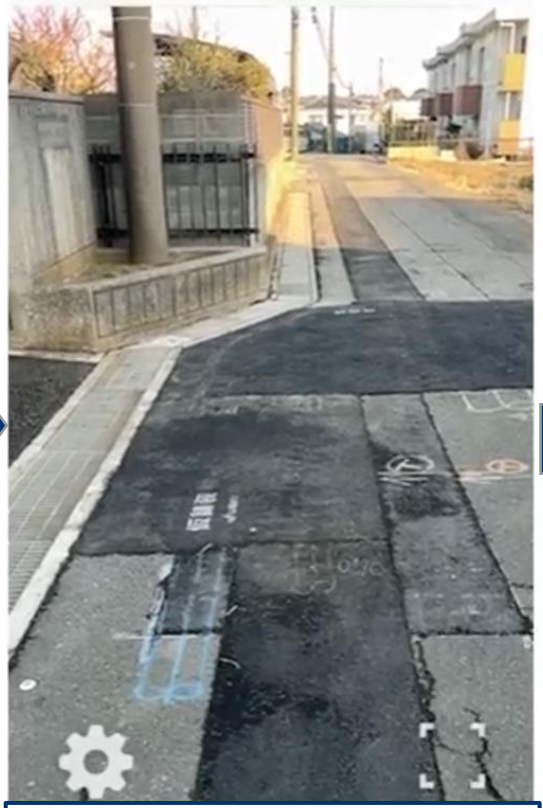
Structure scan: Where to use

Structure scanning can be used when you want to clean corners and other things in small areas. Once you have it, you can check it on the spot. The acquired data can be displayed as is in AR.

Structure scan: Where to use



Buried pipes during construction between the reserves



When reconstructing the work,
It is unknown where the reserves are located.

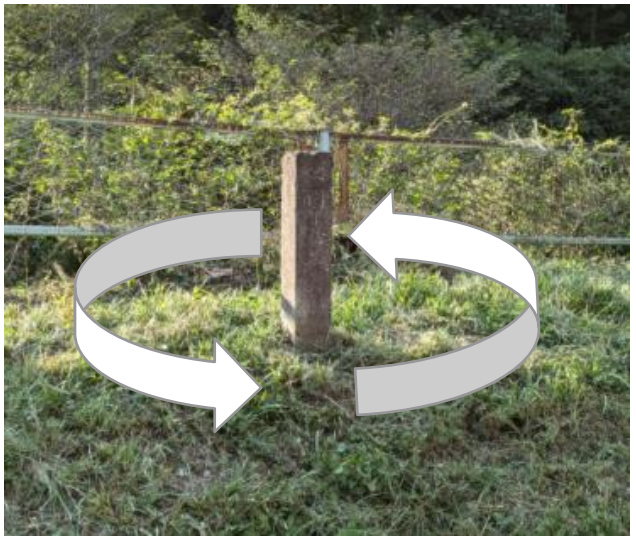
By displaying AR
Check at a glance where the tube is.

By using the structure scanning function, you can create high-precision 3D files with absolute coordinates. You can view the created 3D files from the data list.

Structure Scan: How to use

Press Structure Scan.

Press Start Scan.



While scanning, move the camera slowly without concealing it, and take pictures in motion that moves around the object as much as possible.
You can create and check 3D files in just a few minutes.
If you want to assign absolute coordinates, move at least 6m between the start and end while being fixed.

"Adjust the entire object to fit within the angle of view, and move the camera slowly and smoothly while scanning. Slow movement and shaking can cause distortion.

Structure scan: Tips for how to use

Scan to circumvent the object

Completed drawing

Aligning point cloud files to object files How to assign absolute coordinates to 3D files without absolute coordinates Fix incorrect absolute coordinates

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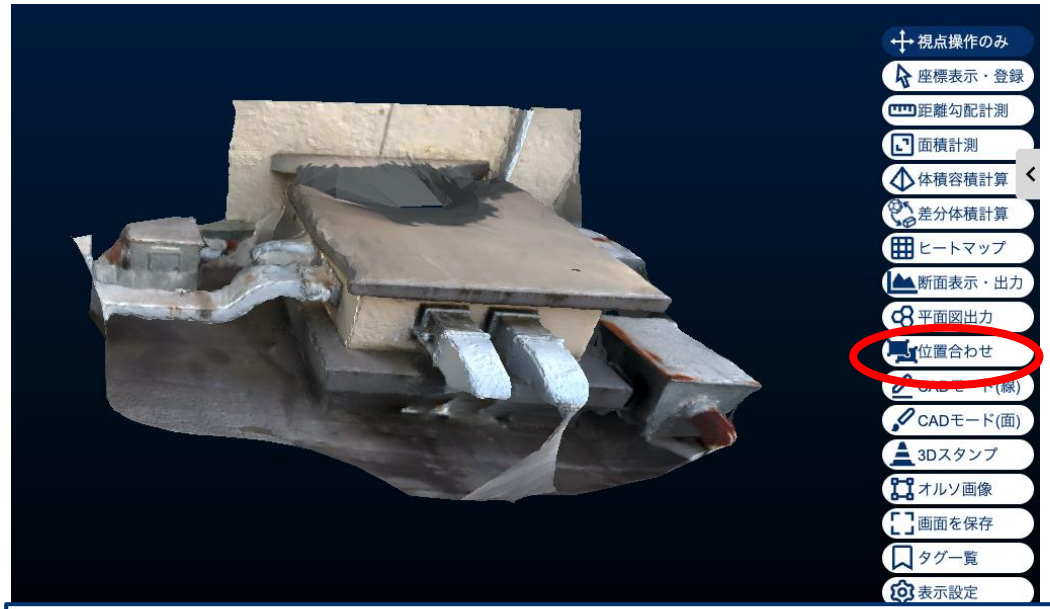
Absolute coordinates for 3D files1

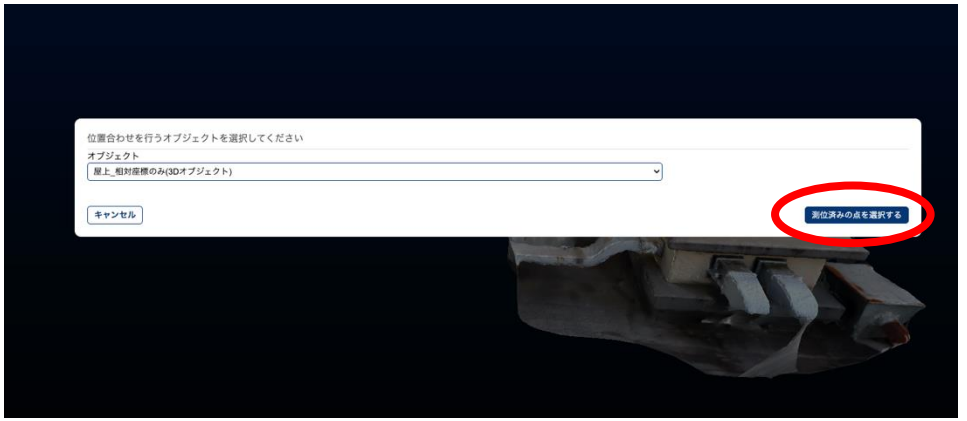
You can assign correct absolute coordinates to point clouds that have a bad system of absolute coordinates, or to 3D files with only relative coordinates. Open the registered 3D file and press Align.

DETAILED STEPS

① Open the object in the 3D viewer and Press the alignment down



② Select the 3D object to be aligned, and Press the Select Point button



Note: Object files can be added using the Add button on the top left of the cloud.
At this time, please swap the X and Y axes as necessary to adjust the file so that it does not become a 3D file that matches the reality and mirror.

Absolute coordinates for 3D files2

Click on the point on the viewer that has the absolute coordinates and enter the absolute coordinates to complete alignment. Files with absolute coordinates added will be automatically registered in the cloud.

DETAILED STEPS

③ Points where absolute coordinates are known in drawings and surveys.Click at least 3 points and press the button to enter coordinates.

④ Enter the absolute coordinates of each point and complete the creation. Once completed, it will be automatically registered in the same group.

By checking "Tilt the model", you can also check files that directly above the model do not match the actual above. Coordinates can be adjusted. Please use it if necessary.

Details of coordinate input using csv

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Input coordinates in csv 1

You can register a list of absolute coordinates in the cloud in CSV format.
You can edit it in Excel and enter it all at once.

Download example csv file

First, press the Add button on the top left of the LRTK cloud to download an example csv file.

Input coordinates in csv 2

Open the downloaded CSV in Excel or similar and enter the coordinate values for X and Y and the coordinate system number. You can also enter the altitude and station name as needed.

Editing csv

X座標[m]	Y座標[m]	平面直角座標系	標高(JGD2011)[m](任意)	グループ名(任意)	測点名(任意)	タグ(任意)
34863.883	-71615.847	15				
41976.742	-72828.556	15				
13959.756	21721.309	15				
17872.238	39016.218	15				
19415.987	-14687.507	15				

Enter the system numbers for plane right angles from 1 to 19 as half-width numbers.
Also, enter the coordinate system name of the site you created,
You can also use a CSV where coordinate values for the site's coordinate system are entered.
*Please use a site coordinate system name other than half-width numbers.

Click the Add button on the top left of the cloud and press the Upload CSV button. Select the edited CSV file to complete data registration with the cloud.

Upload csv

Uploaded data can be synced by pressing "Data → Sync All" in the app.

Save space on your LRTK app

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Save space on your LRTK app

To save space, the LRTK app allows you to delete synced images and point clouds from your smartphone. This allows you to free up the capacity of your iPhone while leaving data in the cloud.

LRTK App: Increase capacity

Select the data you want to delete from the app
Please press the Increase Volume button.
Upload the data before syncing,
It will be removed from the app.