

# 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.

## 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

### 2-1 I want to obtain high-precision coordinates

### 2-2 I want to obtain the average coordinates when positioning for a few seconds

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

### 2-4 I want to obtain the moving trajectory

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

## 3. Photos with high precision coordinates

### 3-1 I want to leave a photo with high-precision coordinates, orientation and

### 3-2 I want to display photos from the same location in chronological order

### 3-2 I want to check with AR display

Here is a list of things you can do with the LRTK Phone and software.  
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### 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

Here is a list of things you can do with the LRTK Phone and software.  
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### 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



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.

### 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

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

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

### 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  $\pm 2\text{cm}$ ,  
Vertical error  $\pm 4\text{cm}$   
With the accuracy of  
Get latitude and  
longitude elevation.

High  
precision  
coordinates



High precision  
coordinates  
Correction  
information for  
acquisition

### LRTK App



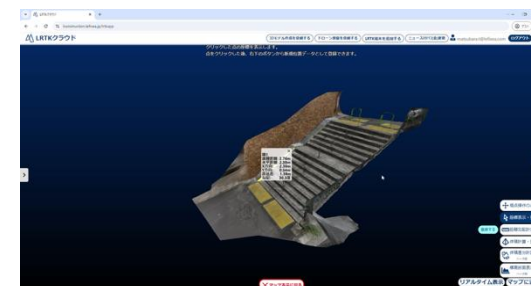
iOS app.  
Using the coordinates of  
the LRTK Phone installed  
on the back of the  
iPhone, you can perform  
positioning, 3D surveying,  
AR display, coordinate  
guidance, etc.

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.

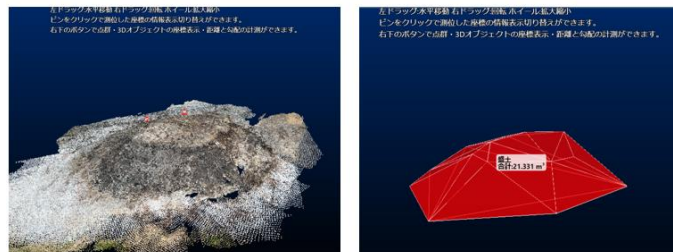
There are many changes in LRTK, but here are a few examples. You will be able to access these features immediately. In addition, almost all of the acquired data can be shared on the LRTK cloud.

## Design



- Support design research with the positioning photography function
- Positioning and output simulation 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>

The diagram illustrates the process of creating an account. It shows two side-by-side screenshots of the LRTK Cloud interface, connected by a large blue arrow pointing from left to right.

**Left Screenshot (Login Screen):**

- Header: LRTKクラウド
- Section: ログイン
- Form fields: ID, パスワード
- Button: ログイン
- Links: [パスワードを忘れてしまった方はこちら](#), [まだ登録がお済みでない方はこちら](#) (highlighted with a red box), [サンプルデータでお試しはこちら](#)
- Footer: よくあるご質問, お問い合わせ, © Lefixea Inc. All Rights Reserved., Privacy Policy

**Right Screenshot (Account Registration Screen):**

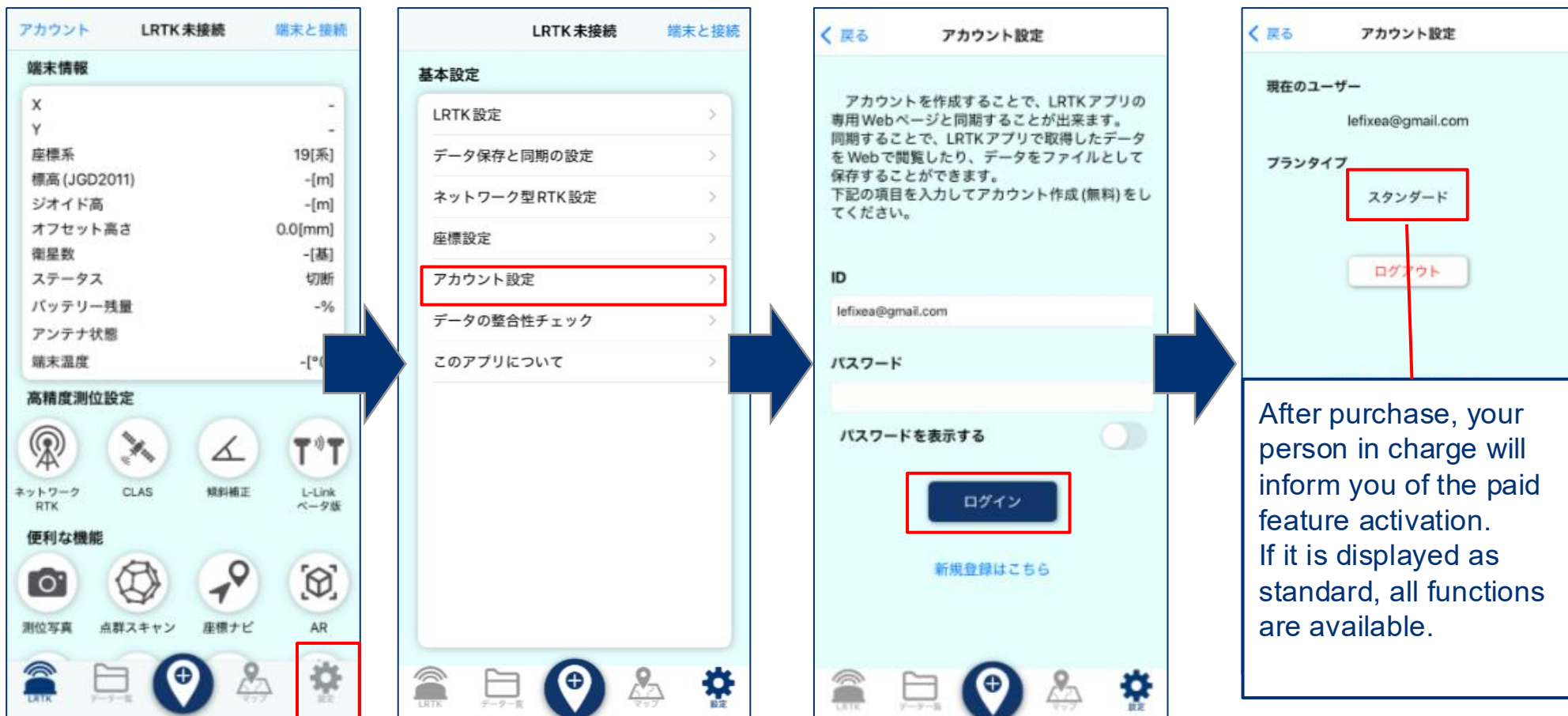
- Header: LRTKクラウド
- Section: アカウント登録
- Form fields: メールアドレス, パスワード, パスワード(確認用)
- Button: アカウント登録 (highlighted with a red box)
- Links: [サンプルデータでお試しはこちら](#), [ログイン画面はこちら](#)
- Footer: よくあるご質問, お問い合わせ, © Lefixea Inc. All Rights Reserved., Privacy Policy

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.

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>



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



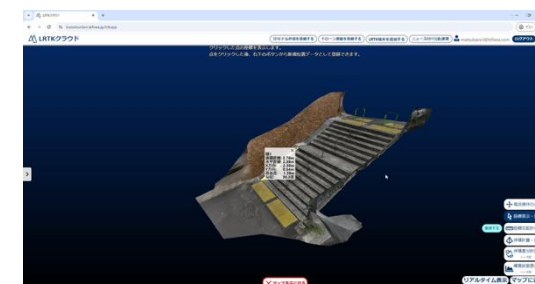
When pressing the sync button

Upload all surveyed data



Download all data added in the cloud

LRTK Cloud





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

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## 2-1 I want to obtain high-precision coordinates

Confidential

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  $\pm 10\text{m}$ .

### How to get coordinates

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

アカウント

LRTK未接続

端末と接続

端末情報

X

Y

座標系

標高 (JGD2011)

ジオイド高

オフセット高さ

衛星数

ステータス

-

-

19[系]

-[m]

-[m]

0.0[mm]

-[基]

切断

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.



アカウント

測位精度 noRTK

切断

端末情報

LRTK Phone4C - 04E1

X

Y

座標系

標高 (JGD2011)

ジオイド高

オフセット高さ

衛星数

ステータス

バッテリー残量

4086.840[m]

9816.379[m]

8[系]

264.545[m]

36.618[m]

190.6[mm]

11[基]

noRTK

28%

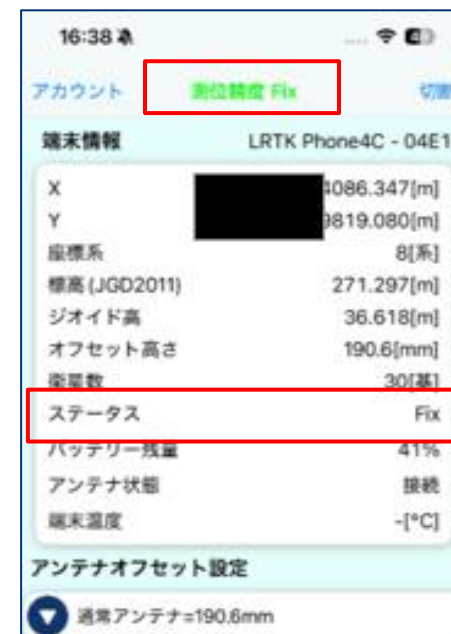
When you start receiving coordinates,  
The coordinates will be displayed on the home screen.  
X and Y are plane perpendicular coordinate systems, and you can select the origin of the plane perpendicular coordinate system from (Settings → Coordinate Settings).

To use LRTK to position with  $\pm 2\text{cm}$  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  $\pm 10\text{m}$   
Float: Within  $\pm 1\text{m}$   
Fix: Within  $\pm 2\text{cm}$   
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.

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

16:38 測位精度 Fix 切断

アカウント LRTK Phone4C - 04E1

端末情報

X 4086.347[m]  
Y 3819.080[m]  
座標系 8[系]  
標高(JGD2011) 271.297[m]  
ジオイド高 36.618[m]  
オフセット高さ 190.6[mm]  
衛星数 30[基]  
ステータス Fix  
バッテリー残量 41  
アンテナ状態 接続  
端末温度 -1[°C]

アンテナオフセット設定

通常アンテナ=190.6mm

高精度測位設定

保存先 20241012

タイトル T 1

次回以降表示しない

連番をつける

メモ メモを再利用する

一つ目の測量点

キャンセル OK

位置データ一覧

選択中の2件を ダウンロード 共有 移動 削除

- ☒ 20240919 2件 更新: 2024/9/19 9:59:50
- ☒ test 10件 更新: 2024/9/13 18:48:38
- ☒ 20240903 17件 更新: 2024/9/4 13:13:03
- ☒ 240903つくば試験 4件 更新: 2024/9/2 18:02:36
- ☒ 20240829 5件 更新: 2024/8/29 15:26:51
- ☒ ビル屋上座標 5件 更新: 2024/8/29 11:56:17
  - ☐ building 3D
  - ☐ plane\_with\_fence 3D
  - ☐ ビル 3D
  - ☒ T\_2 詳細
  - ☒ T\_1 詳細

ビル屋上座標

X-37594.268[m]  
Y-8756.007[m]  
標高(JGD2011):0.000[m]  
平面直角座標系: 9系  
画像なし  
詳細を確認する

X-37602.268[m]  
Y-8752.007[m]  
標高(JGD2011):0.000[m]  
平面直角座標系: 9系  
画像なし  
詳細を確認する

マップ操作

距離勾配計測

リアルタイム表示 マップに追加

Tap the save

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





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.

アカウント
測位精度 noRTK
切断

バッテリー残量

65%

アンテナ状態

接続

端末温度

-[°C]

アンテナオフセット設定

閉じる

190.6mm

860.0mm

合計:1050.6mm

アンテナ

通常

圏外対応

設置ツール

ポール

石突

その他

なし

延長なし

1段延長

2段延長

3段延長

LRTK

データ一覧

+

マップ

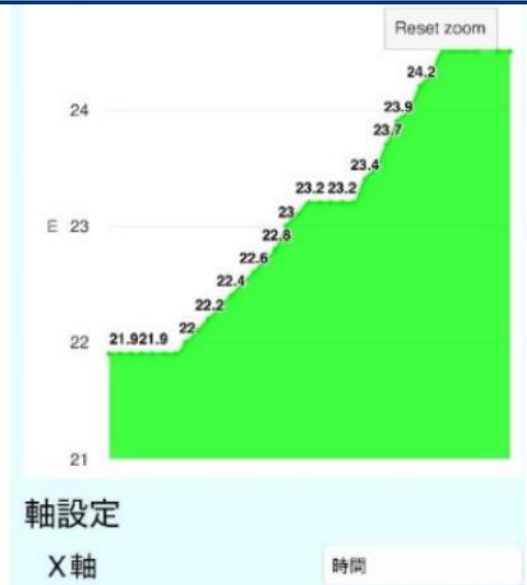
設定

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

The screenshot displays the LRTK Cloud web interface. The main area shows an aerial map with a red line indicating a trajectory. The interface includes a header with the LRTK Cloud logo, a user profile, and a logout button. The map area has tabs for '地図' (Map) and '航空写真' (Aerial Photo). The right sidebar, titled 'ロギング2' (Logging 2), contains a table of logging data. The table has two sections, each with a 'CSV' download button. The first section shows data for a specific location, and the second section shows data for a different location.

**ロギング2**

この座標をダウンロード: **CSV**

| タイトル           | ロギング2              |
|----------------|--------------------|
| 測位タイプ          | ロギング               |
| 日時             | 2024/5/14 17:23:53 |
| 緯度             | 35.65650371        |
| 経度             | 139.74548266       |
| 標高(WGS84)      | 9.191              |
| 標高(JGD2011)    | 11.999             |
| ジオイド高(WGS84)   | 39.389             |
| ジオイド高(JGD2011) | 36.581             |
| X              | -38105.547         |
| Y              | -7954.353          |
| 平面直角座標系        | 9                  |
| RTKステータス       | Fix                |
| }              |                    |
| 日時             | 2024/5/14 17:25:04 |
| 緯度             | 35.65655566        |
| 経度             | 139.74535022       |
| 標高             | 9.194              |
| 標高(JGD2011)    | 12.001             |
| ジオイド高          | 39.389             |
| ジオイド高(JGD2011) | 36.582             |
| X              | -38099.773         |
| Y              | -7954.353          |

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

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.



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

#### overview

##### 1-1 LRTK System Configuration

##### 1-2 Changes with LRTK

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

#### 3. Photos with high precision coordinates

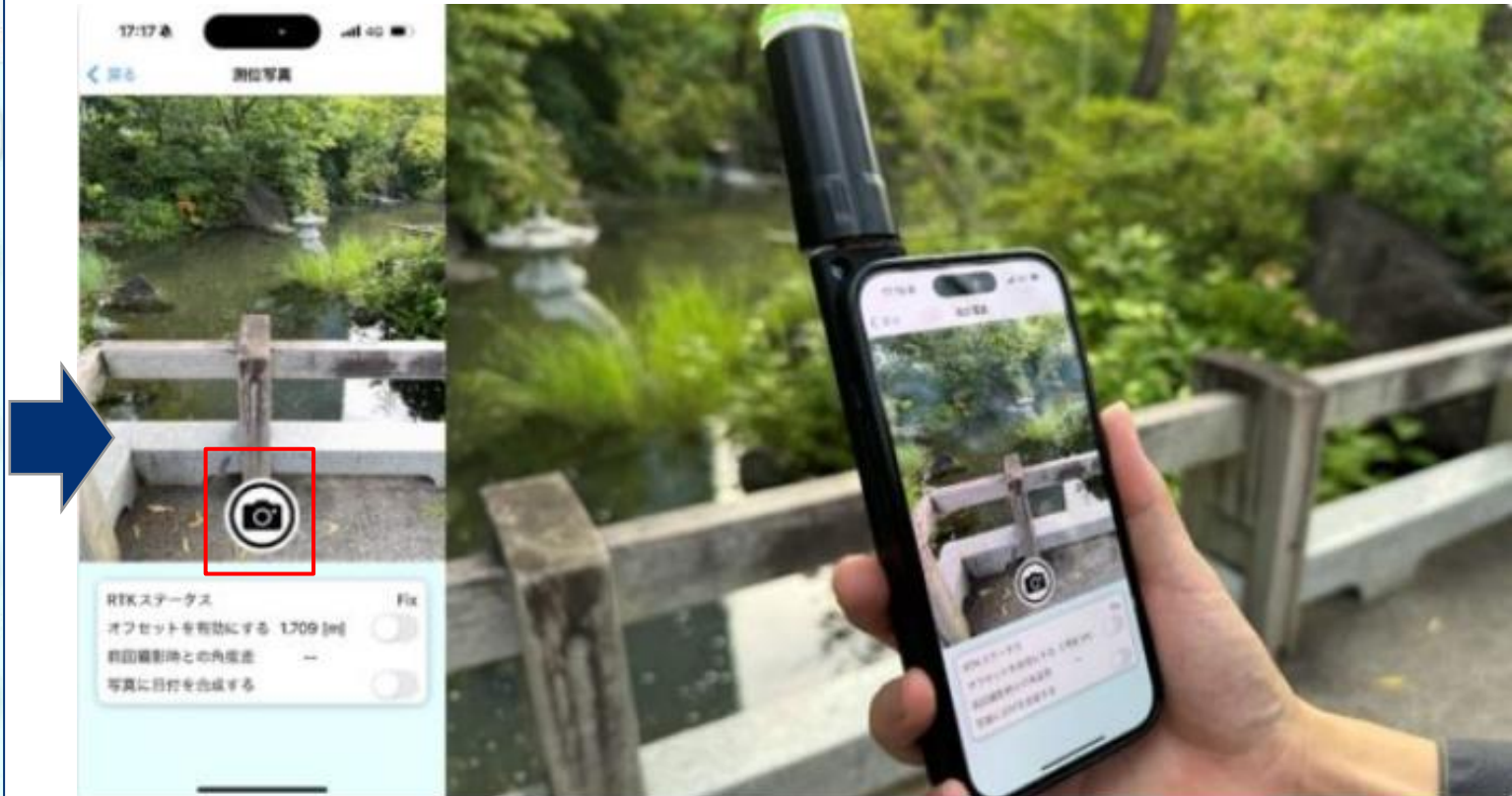
##### 3-1 I want to save photos with high-precision coordinates, orientation and orientation

##### 3-2 I want to display photos from the same location in chronological order

##### 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.

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 screenshot displays the LRTK cloud interface. The main area shows an aerial map with several red location pins. Two pop-up windows provide details for specific photos:

- Left Pop-up:**  
2024/05/14  
X:-38069.070[m]  
Y:-7961.772[m]  
標高(JGD2011):11.610[m]  
平面直角座標系: 9系  
Includes a photo thumbnail and a link to "詳細を確認する" (Check details).
- Right Pop-up:**  
画像5  
X:-38081.151[m]  
Y:-7930.175[m]  
標高(JGD2011):12.404[m]  
平面直角座標系: 9系  
Includes a photo thumbnail and a link to "詳細を確認する" (Check details).

Yellow arrows on the map indicate the shooting direction for each pin. The sidebar on the right shows the date "2024/05/14" and download options: "この座標をダウンロード" (Download this coordinate) with buttons for "CSV", "PDF", and "写真のみ" (Photos only). Other sidebar elements include "RTKステータス" (RTK status) showing "notSurvey", "メモ" (Memo) with a "クリップボードにコピー" (Copy to clipboard) button, and a "写真" (Photos) section displaying a photo of a park area.

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 screenshot displays the LRTKクラウド (LRTK Cloud) web application. On the left, a sidebar lists various data groups under '位置データ一覧' (Location Data List). The group '点検' (Inspection) is selected, showing a list of items including '20240819', '体積テスト2', 'テスト用2', 'テスト用', '20240722', '20240722', '20240722', and 'device2'. The '点検' group is highlighted with a red box, and its details are shown in the main view.

The main view shows a map of a city street with a red pin indicating the location. Below the map, a detailed view of the location is displayed, showing a sequence of photos taken at the same location over time. The photos are arranged in a grid, with the first photo showing a 'No Parking' sign. The date and time for each photo are displayed above the image. The photos show the sign from different angles and at different times, illustrating the time series display feature.

The interface also includes a top navigation bar with options like 'モデル作成' (Model Creation), 'ドローン測量' (Drone Surveying), 'LRTK追加' (Add LRTK), 'ニュース' (News), and 'ログアウト' (Logout). A sidebar on the right contains a search bar and a list of data groups.

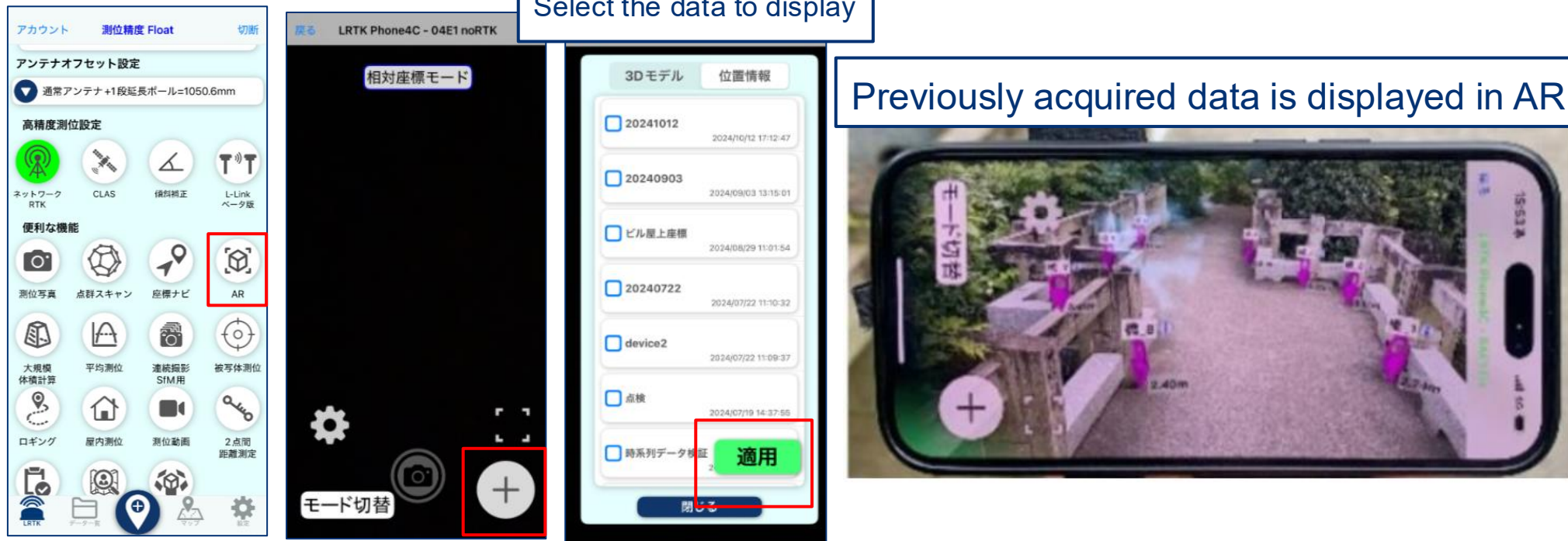
The storage group inspects and the positioning photo data with the title prohibited parking is all collected. Click Details to display time series data. You can also change groups saved in the cloud/positioning photos titles,

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.

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

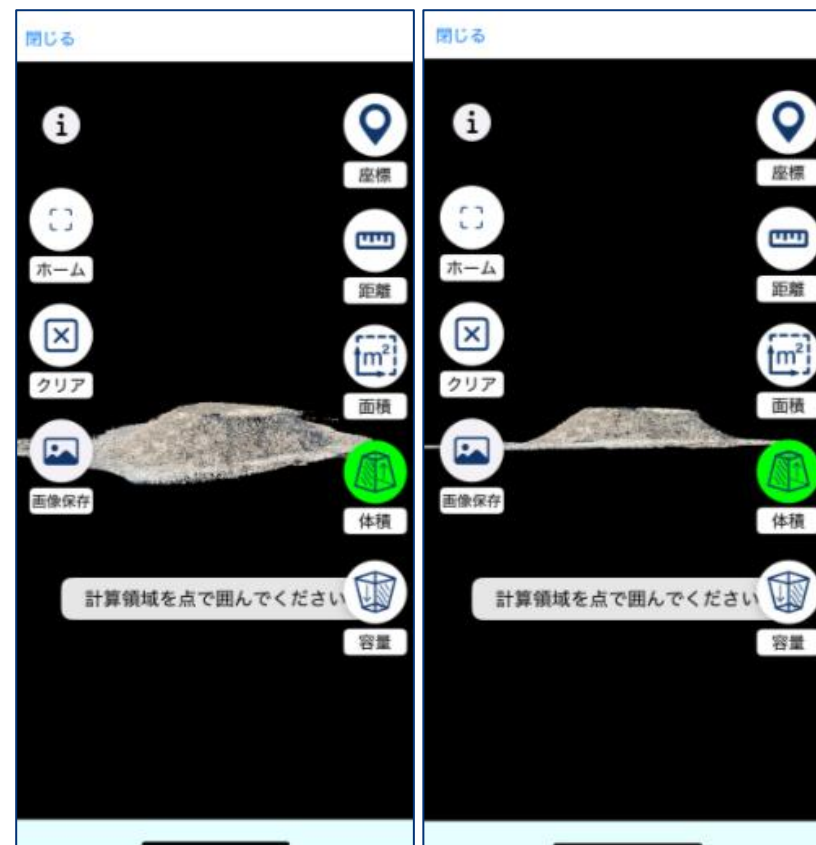


## 4-1 I want to obtain a point cloud with absolute coordinates

Confidential

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



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.





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.

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.

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



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



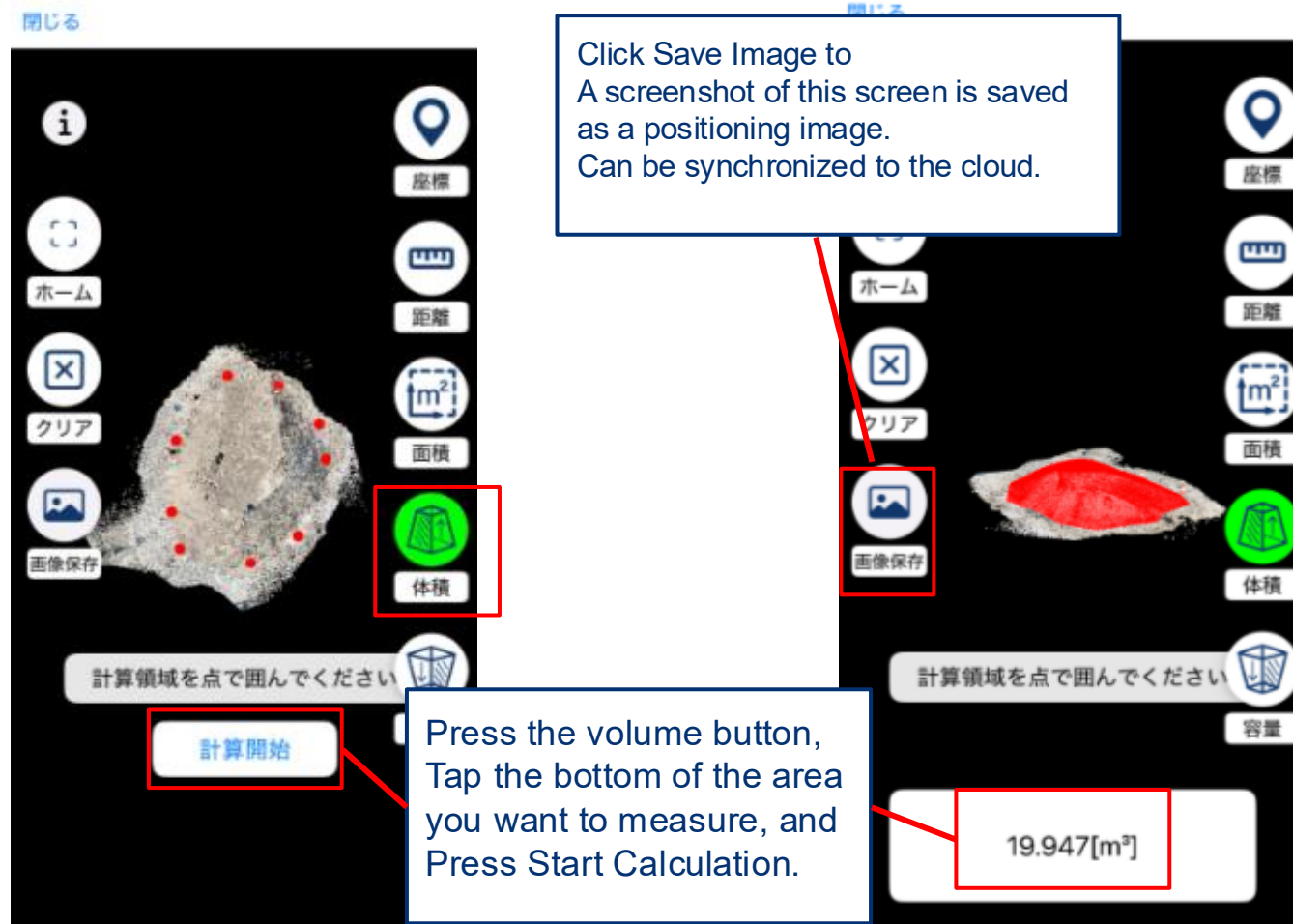
Another way to get the area from multiple positioning points.  
You can see both the horizontally projected area and the three-dimensional area.

## How to find the area from the positioning point



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.

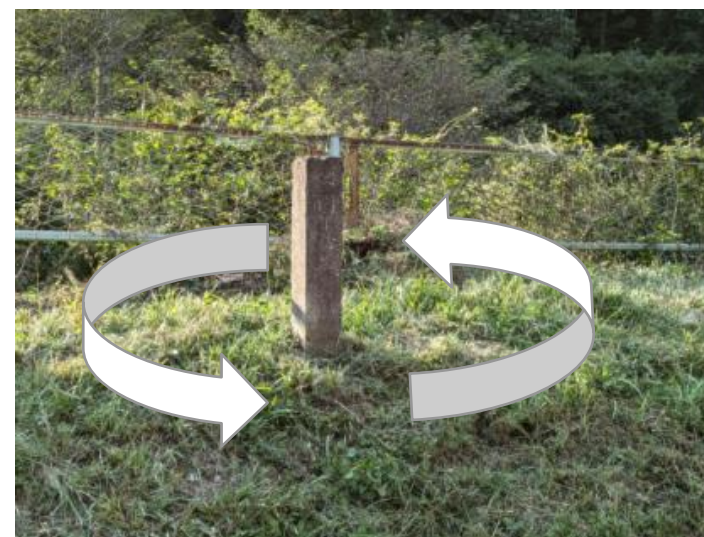
### Displaying volume/volume in point cloud viewer





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.

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

## Created 3D file



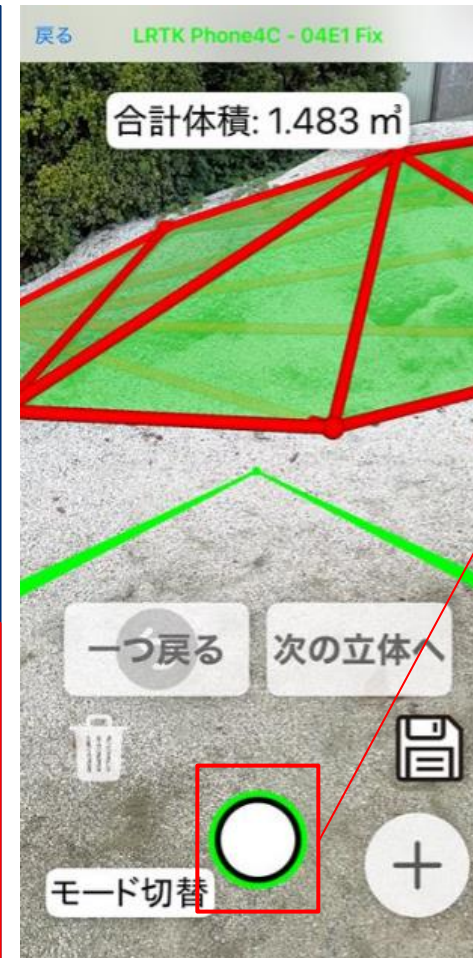


It is possible to obtain and store large volumes using AR display. You can easily visually obtain the volume by standing up the pins over the area where you want to obtain the volume.

### 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.

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.

### 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

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

The screenshot displays the LRTK Cloud web interface. On the left sidebar, under '位置データ一覧' (Location Data List), there is a list of point cloud data. The selected item is '2024-05-30\_020444.xyz', and its '3D' button is highlighted with a red box. A blue arrow points from this button to the 3D viewer window on the right. The 3D viewer shows a point cloud of a staircase. The interface also includes a top navigation bar with '3Dモデル作成を依頼する' (Request 3D Model Creation) and 'ドローン測量を依頼する' (Request Drone Surveying) buttons. The bottom right corner of the 3D viewer has a 'リアルタイム表示' (Real-time Display) button and a 'マップに追加' (Add to Map) button.



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

The screenshot displays the Lefixea software interface. On the left is a sidebar titled '位置データ一覧' (Position Data List) with an '追加' (Add) button. It shows a list of files under the folder '階段' (Staircase), including '階段手すり' (Staircase Handrail), '階段測位写真2' (Staircase Positioning Photo 2), '階段測位写真1' (Staircase Positioning Photo 1), and a file '2024-05-30\_020444.xyz'. The main area shows a 3D point cloud of a staircase. Three points are highlighted with callouts: 点1 (x: -37710.117m, y: -8761.734m, z: 28.330m), 点2 (x: -37712.297m, y: -8762.238m, z: 27.139m), and another point (x: -37710.121m, y: -8758.797m, z: 28.340m). At the bottom right, a toolbar contains buttons for '登録する' (Register), '座標表示・登録' (Show Coordinates・Register), '距離勾配計測' (Distance Slope Measurement), '体積計算・登録' (Volume Calculation・Register), '差分体積計算' (Difference Volume Calculation), and '標高断面表示' (Elevation Section Display). A red box highlights the '登録する' and '座標表示・登録' buttons. A red button at the bottom center says 'マップ表示に戻る' (Return to Map Display). At the bottom right, there are buttons for 'リアルタイム表示' (Real-time Display) and 'マップに追加' (Add to Map).

位置データ一覧

追加

クリックした点の座標を表示します。  
点をクリックした後、右下のボタンから新規位置データとして登録できます。

選択中の2件を **ダウンロード** **共有** **移動** **削除**

階段  
4件 更新: 2024/7/9 10:06:46

- ☒ 階段手すり 3D
- ☐ 階段測位写真2 詳細
- ☐ 階段測位写真1 詳細
- ☒ 2024-05-30\_020444.xyz 3D

点1  
x: -37710.117m  
y: -8761.734m  
z: 28.330m

点2  
x: -37712.297m  
y: -8762.238m  
z: 27.139m

x: -37710.121m  
y: -8758.797m  
z: 28.340m

視点操作のみ

登録する 座標表示・登録

距離勾配計測

体積計算・登録

差分体積計算

標高断面表示

リアルタイム表示 マップに追加

マップ表示に戻る



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

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

The screenshot displays the LRTK Cloud web interface. On the left, a sidebar titled '位置データ一覧' (Location Data List) shows a list of files. The main area shows a 3D point cloud of a staircase with two measurement lines, '線1' and '線2', highlighted. Data popups for these lines are visible. On the right, a vertical toolbar contains various measurement and display options. A red box highlights the '登録する' (Register) and '距離勾配計測' (Distance Gradient Measurement) buttons. A red box at the bottom left of the 3D view contains the text '× マップ表示に戻る' (Return to map display).

**Line 1 Data:**

- 直線距離: 5.73m
- 水平距離: 5.10m
- X方向: 4.94m
- Y方向: 1.28m
- 高低差: 2.61m
- 勾配: 27.1度

**Line 2 Data:**

- 直線距離: 3.73m
- 水平距離: 3.73m
- X方向: 1.44m
- Y方向: 3.44m
- 高低差: 0.04m
- 勾配: 0.7度

**File List (Left Sidebar):**

- 階段 (4件, 更新: 2024/7/9 10:06:46)
- ☒ 階段手すり (3D)
- ☐ 階段測位写真2 (詳細)
- ☐ 階段測位写真1 (詳細)
- ☒ 2024-05-30\_020444.xyz (3D)

**Toolbar (Right):**

- 視点操作のみ
- 座標表示・登録
- 登録する** (highlighted)
- 距離勾配計測** (highlighted)
- 体積計算・登録
- 差分体積計算
- 標高断面表示
- リアルタイム表示
- マップに追加

**Bottom Left:**

- × マップ表示に戻る

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

 LRTKクラウド

位置データ一覧

追加

選択中の4件を [ダウンロード](#) [共有](#) [移動](#) [削除](#)

階段

4件 更新: 2024/7/9 10:06:46

☒ 階段手すり

3D

☒ 階段測位写真2

詳細

☒ 階段測位写真1

詳細

☒ 2024-05-30\_020444.xyz

3D

3Dモデル作成を依頼する

ドローン測量を依頼する

万能測量機 LRTK Phone 詳細はこちら

地図

航空写真

距離と勾配を計測します。始点のピンをクリックしてください。

9.865m

マップ操作

登録する

距離勾配計測

リアルタイム表示

マップに追加

作成中の線

|        |             |
|--------|-------------|
| 直線距離   | 9.865m      |
| 水平距離   | 9.414m      |
| X方向距離  | -8.341m     |
| Y方向距離  | -4.365m     |
| 高低差    | -2.947m     |
| 勾配     | -17.4度      |
| X(始点)  | -37708.553m |
| Y(始点)  | -8758.526m  |
| 標高(始点) | 29.739m     |
| X(終点)  | -37716.894m |
| Y(終点)  | -8762.891m  |
| 標高(終点) | 26.792m     |



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

3Dモデル作成を依頼する

ドローン測量を依頼する

LRTK端末を追加する

ニュース10/08(火)更新

lefixea@gmail.com

ログアウト

点群か3Dオブジェクトをクリックし、点を作成してください。  
4点以上作成すると、それらを包む体積を計算します。  
「次の立体へ」ボタンを押すことで、複数の立体を1つの体積として登録できます。  
1個目の立体を作成中です。15個目の点をクリックしてください。

合計: 21.331 m³

+

視点操作のみ

📍

座標表示・登録

📏

距離勾配計測

📐

体積計算・登録

🔄

差分体積計算

📊

標高断面表示

リアルタイム表示

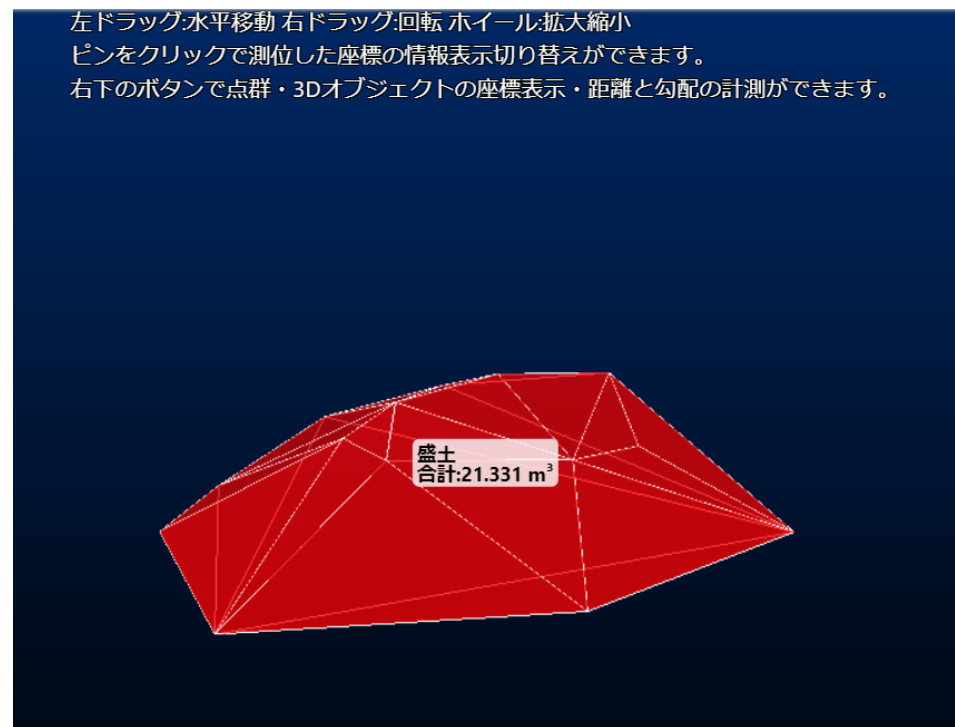
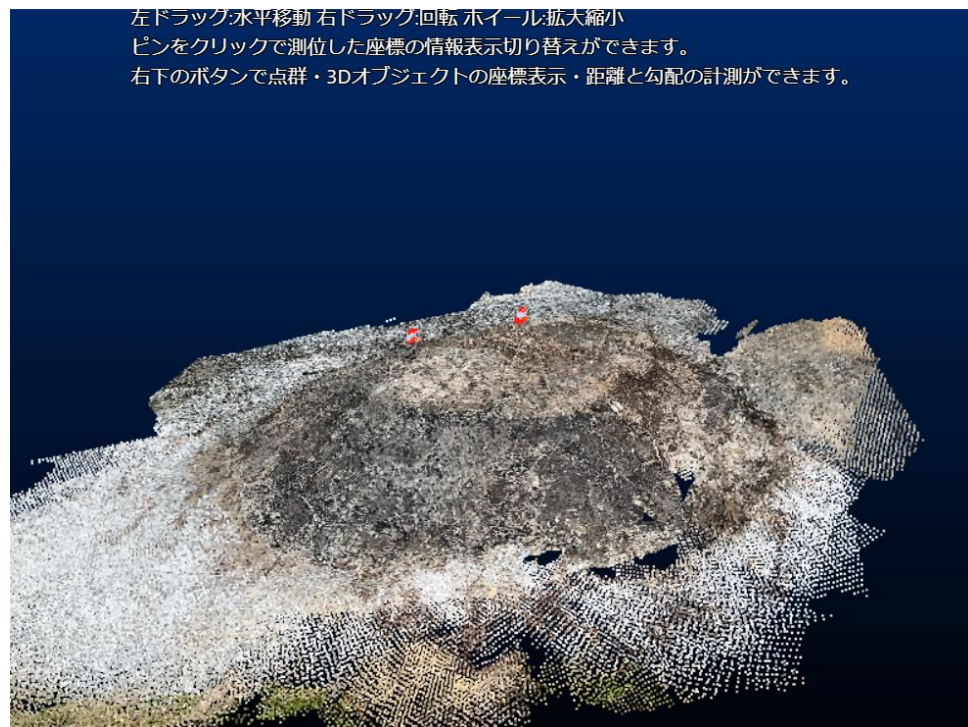
マップに追加

🗑️

マップ表示に戻る

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






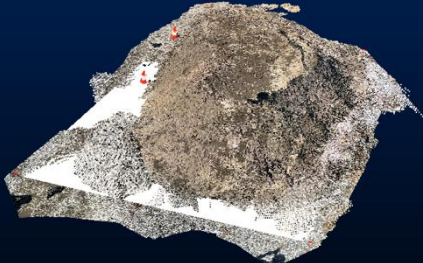
You can view the design drawings and current point clouds and calculate the volume required to follow the design. It can be used for daily progress management, etc.


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

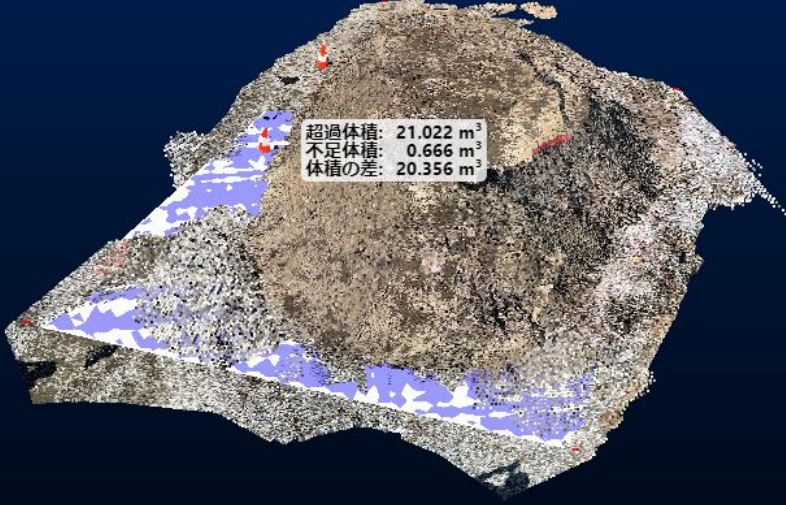
Plane drawing  
(The state to be)



Current situation group







✚ 視点操作のみ

📍 座標表示・登録

📏 距離勾配計測

📐 体積計算・登録

差分削除
登録する
🔄 差分体積計算

📊 標高断面表示

リアルタイム表示 マップに追加

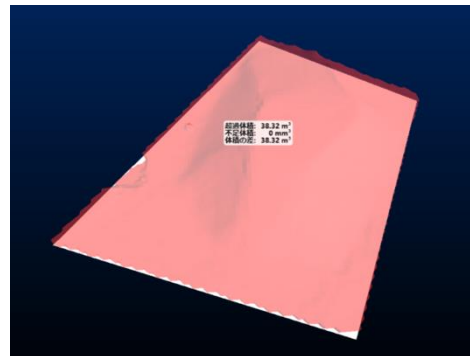
✖ マップ表示に戻る

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.

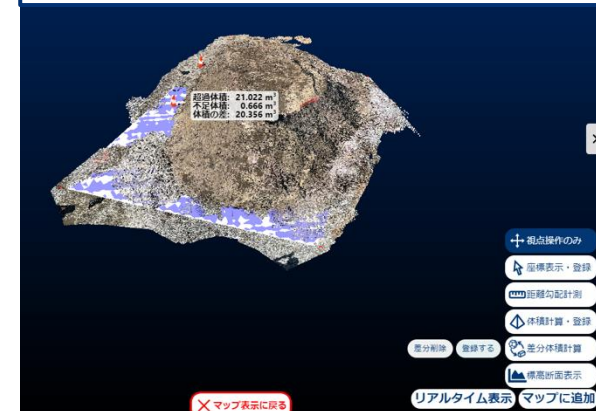
If the difference is shallow over a wide area, even a few centimeters of the point cloud will result in a large volume error. This small height adjustment is possible either automatically or manually.

## How to correct the elevation

### Volume error due to altitude deviation



### After correction



差分体積計算の設定

☒ 標高を補正する

自動補正 値を入力して補正

点群の誤差を抑えるため、差分計算対象2つの端の標高が同じになるように標高を調節してから差分計算を行います。

キャンセル

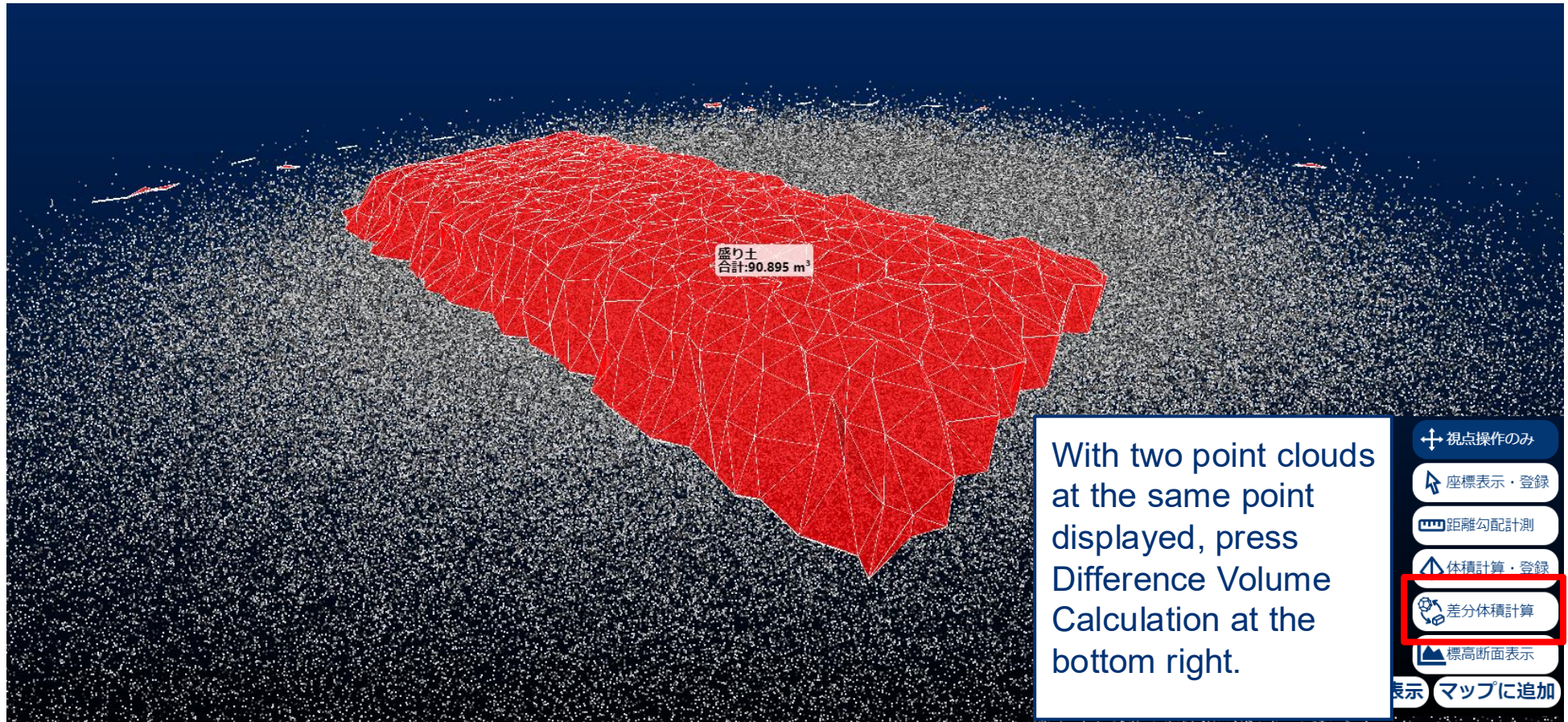
差分計算する

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



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

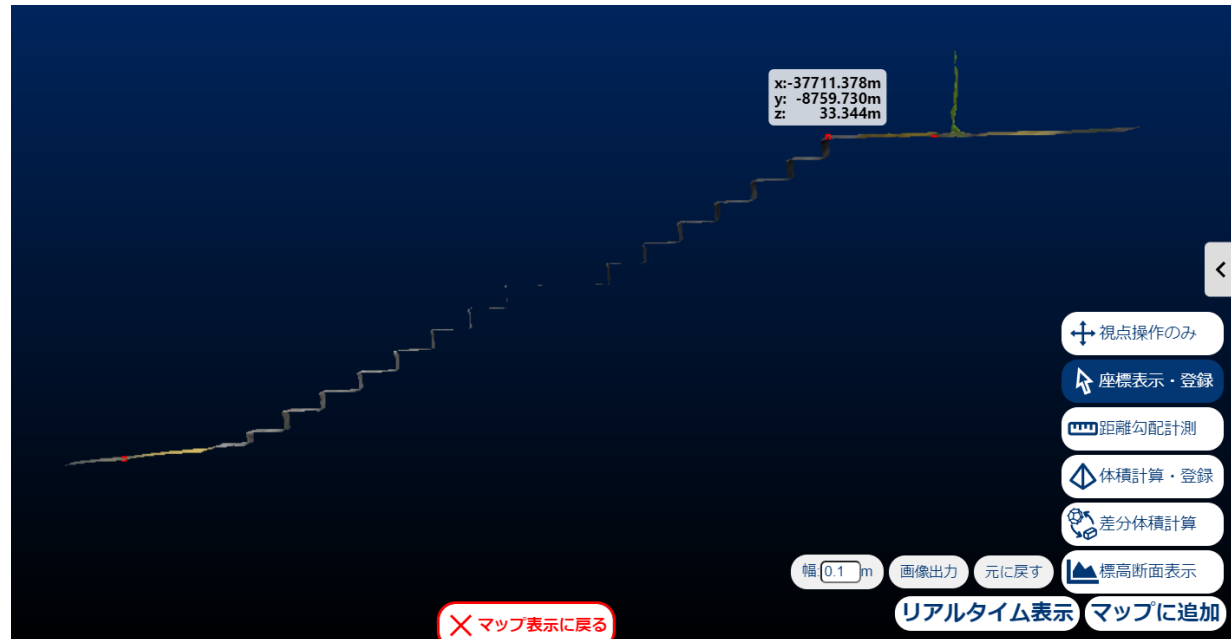
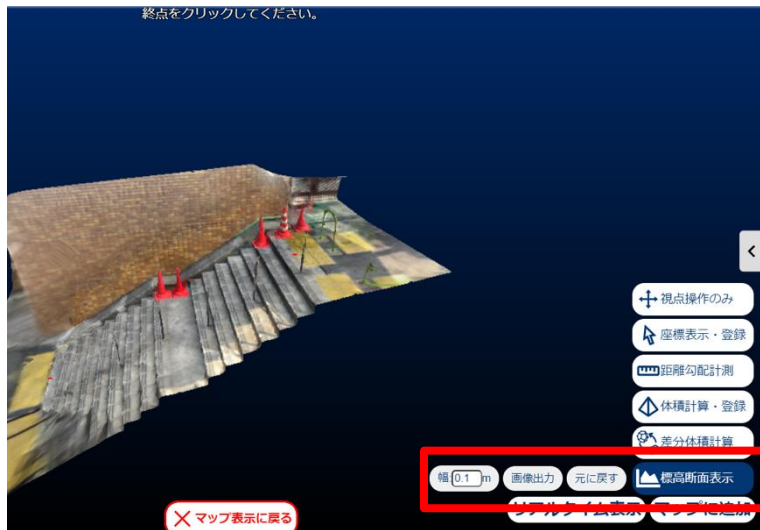


## 5-6 Check the cross section of a point cloud or 3D file

Confidential

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.



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.)

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

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

The screenshot displays the LRTKクラウド (LRTK Cloud) web application. The top navigation bar includes the LRTKクラウド logo, several utility buttons (3Dモデル作成を依頼する, ドローン測量を依頼する, LRTK端末を追加する, ニュース10/08(火)更新), a user profile icon with the email matsubara.t@lefixea.com, and a ログアウト button. The main interface is divided into a left sidebar and a central map area. The sidebar shows a list of data items under the heading '位置データ一覧'. One item, '20241012', is selected, and a red box highlights the '共有' (Share) button. A modal dialog titled 'データ共有' (Data Sharing) is open in the center. It contains a list of selected data items: 'T\_1', 'フィールド\_3', 'フィールド\_2', 'フィールド\_1', 'ロギング測位', and two timestamps. To the right of the list, there are settings for 'パスワード設定' (Password Setting) with '有' (Yes) selected, and '閲覧期限' (Viewing Period) set to '2024/11/12'. At the bottom of the modal, there are 'キャンセル' (Cancel) and '共有リンクをコピー' (Copy Sharing Link) buttons. The background map shows a satellite view of a forested area.

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>



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

### 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

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.

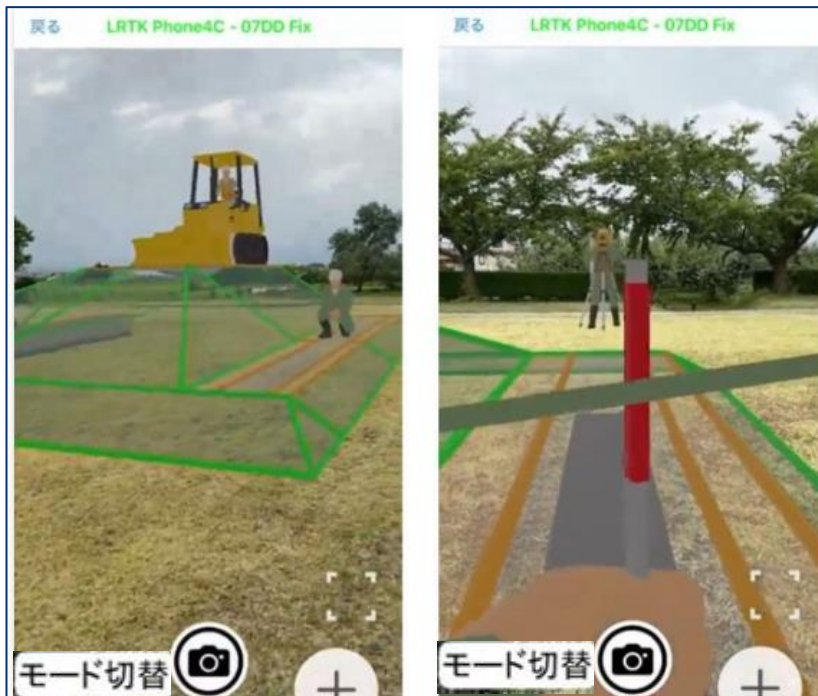


Select the one you want to display from the 3D files with absolute coordinates uploaded in the cloud.



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.





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

Confidential

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.

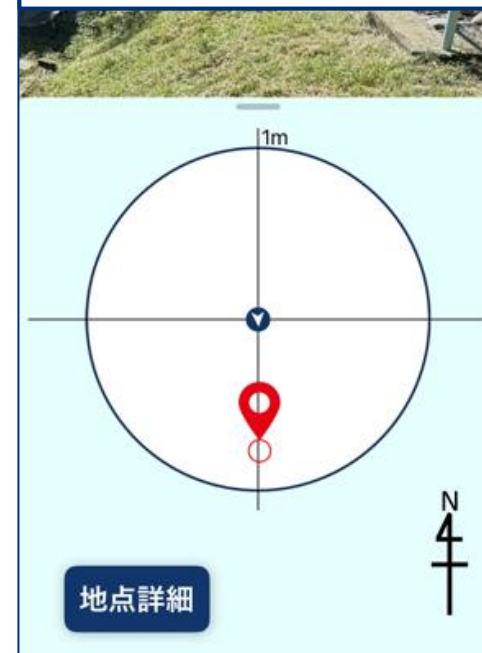


Select the Location tab and select the group containing the data you want to display.



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.





## 7-4 I want to display borders in AR display

Confidential

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

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



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

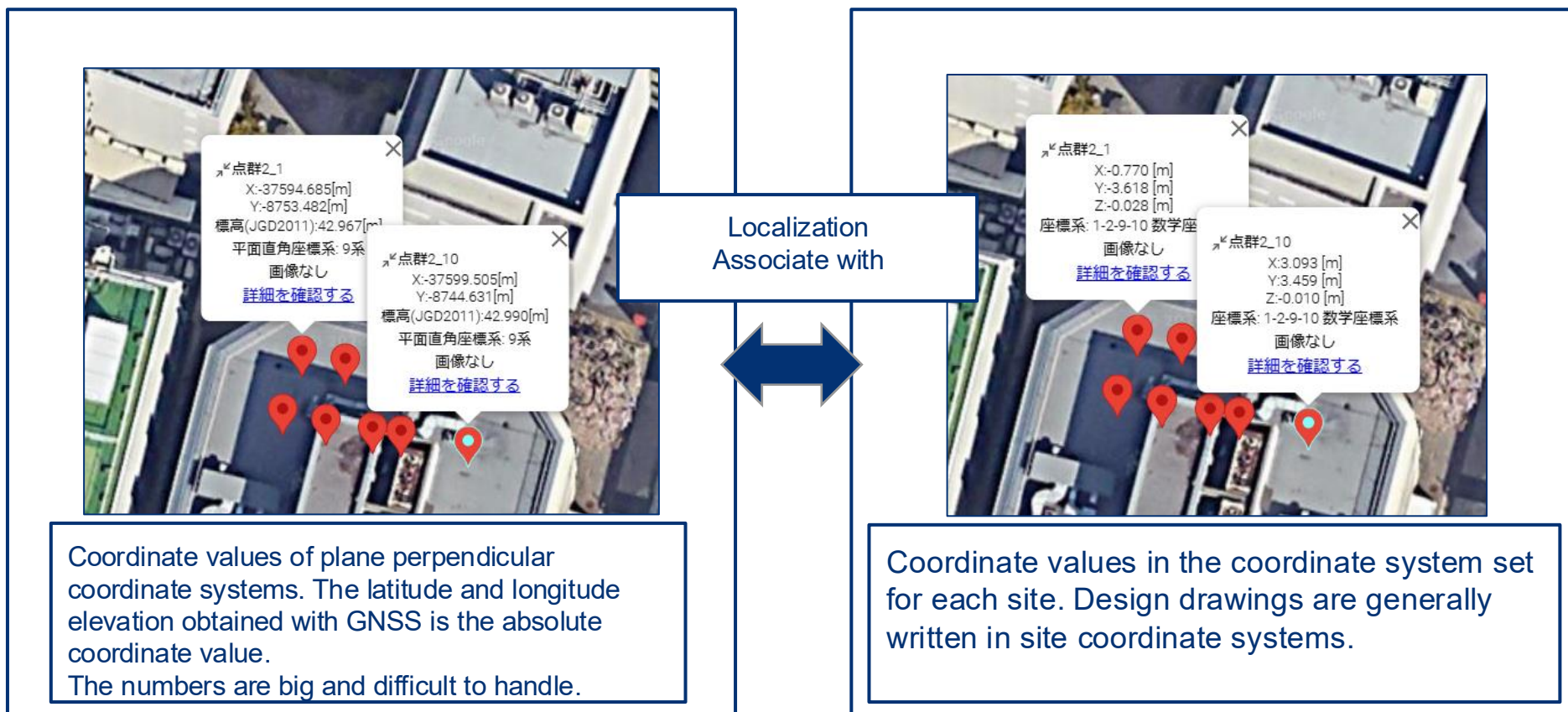
The screenshot displays the LRTKクラウド (LRTK Cloud) web application interface. The top navigation bar includes the LRTKクラウド logo, user information (matsubara.t@lefixea.com), and a logout button. The main interface is divided into a sidebar on the left and a central map area. The sidebar contains several options: '位置情報追加' (Add location information), '座標を追加' (Add coordinates), 'csvファイルのダウンロード' (Download CSV file), '図面を重ねる' (Overlay drawing), '3Dオブジェクトを追加' (Add 3D object), and 'グループを追加' (Add group). The central map area shows a Google Map with a site drawing overlaid. A modal window is open for adding coordinates, with fields for '赤点座標(10進法)' (Red point coordinates) and '青点座標(10進法)' (Blue point coordinates), a '保存先グループ' (Save to group) dropdown, and a '図面名' (Drawing name) input field. A blue arrow points from the modal to a final map view showing the drawing overlaid on the 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.



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



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)

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

**現場の座標を作成**

現場座標系での座標値を入力してください。

入力座標系の種類  
数学座標系

| 座標点名   | 現場の座標X(m) | 現場の座標Y(m) | 現場の座標Z(m) |
|--------|-----------|-----------|-----------|
| 点群2_10 | X座標       | Y座標       | Z座標       |
| 点群2_9  | X座標       | Y座標       | Z座標       |
| 点群2_8  | X座標       | Y座標       | Z座標       |
| 点群2_7  | X座標       | Y座標       | Z座標       |

キャンセル 作成する

**現場の座標を確認**

座標誤差を確認し登録してください。

保存先グループ  
新しいグループに登録 既存のグループに追加

既存グループ名  
20240829

タイトル  
標準座標系

| 座標点名 | X誤差(m) | Y誤差(m) | Z誤差(m) |
|------|--------|--------|--------|
| 点1   | 0.001  | -0.004 | -0.234 |
| 点2   | -0.001 | 0.003  | 0.017  |
| 点3   | 0.003  | -0.003 | 0.053  |
| 点4   | -0.003 | 0.004  | 0.165  |

やり直す 保存する

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.

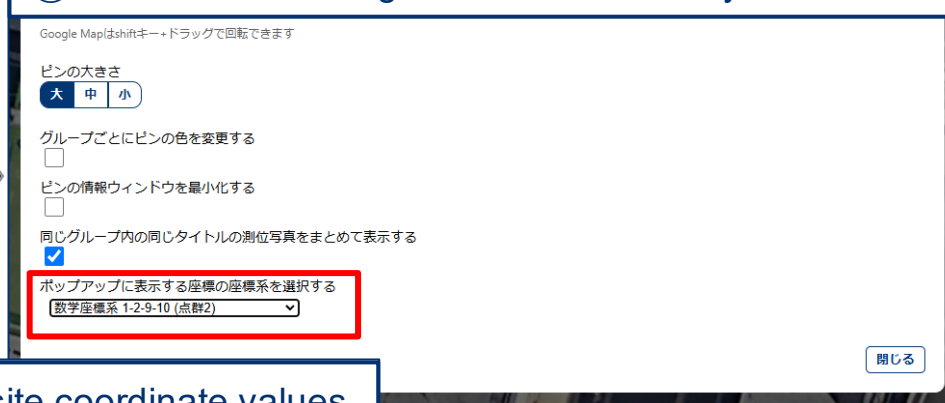
It is possible to display coordinate values in the created coordinate system on the LRTK cloud.

### 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.

| 詳細情報           |                     |
|----------------|---------------------|
| 測点             | 点群2_10              |
| 測位タイプ          | 単点測位                |
| 日時             | 2024/10/15 15:26:02 |
| 緯度             | 35.66105835         |
| 経度             | 139.73674907        |
| 標高(JGD2011)    | 42.990              |
| 標高(WGS84)      | 40.260              |
| ジオイド高(JGD2011) | 36.645              |
| ジオイド高(WGS84)   | 39.375              |
| X              | -5.191              |
| Y              | 4.642               |
| Z              | -0.016              |
| 座標系            | 数学座標系 1-2-9-10      |
| RTKステータス       | Fix                 |

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

3Dモデル作成を依頼する
ドローン測量を依頼する
LRTK端末を追加する
ニュース10/08(火)更新
matsubara.t@lefixea.com
ログアウト

位置データ一覧

追加

位置情報追加
座標を追加

csvファイル例のダウンロード

CSVをアップロードして位置情報を追加

GeoJSONファイルをアップロードして位置情報を追加

SIMAファイル(CSV形式)をアップロードして位置情報を追加

XY/緯度経度を手入力して位置情報を追加

GeoJSONをgoogle mapに重ねて単点登録

LandXMLをgoogle mapに重ねて単点登録

3Dオブジェクトを追加

objファイル(絶対座標付き)を位置データ一覧に追加

グループを追加

キャンセル

☒ テスト用

0件
更新：2024/8/1 9:53:48

☒ 20240722

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      |

Lefixea Inc.

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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.

**ダウンロード**

選択中の12個のデータをダウンロードします。線データ・図画は非対応です。

点群2\_10  
点群2\_9  
点群2\_8  
点群2\_7  
点群2\_6  
点群2\_5  
点群2\_4  
点群2\_3

☒ CSVダウンロード  
    ☒ No  
    ☒ 測点名  
    ☒ 測位タイプ  
    ☒ 日付

座標系: 1-2-9-10 数字座標系 (1-2-9-10 数字座標系)

☒ 点群データダウンロード (1件選択中)  
☒ 測位写真ダウンロード  
☐ SIMAダウンロード  
☐ 観測簿ダウンロード  
☒ 3Dオブジェクトダウンロード (0件選択中)  
☒ 体積データダウンロード (1件選択中)

**ダウンロードする**

点群2\_1  
X:-37594.685[m]  
Y:-8753.482[m]  
標高(JGD2011):42.967[m]  
平面直角座標系: 9系  
画像なし  
[詳細を確認する](#)

点群2\_10  
X:-37599.505[m]  
Y:-8744.631[m]  
標高(JGD2011):42.990[m]  
平面直角座標系: 9系  
画像なし  
[詳細を確認する](#)

点群2\_1  
X:-0.770 [m]  
Y:-3.618 [m]  
Z:-0.028 [m]  
座標系: 1-2-9-10 数字座標系  
画像なし  
[詳細を確認する](#)

点群2\_10  
X:3.093 [m]  
Y:3.459 [m]  
Z:-0.010 [m]  
座標系: 1-2-9-10 数字座標系  
画像なし  
[詳細を確認する](#)

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

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

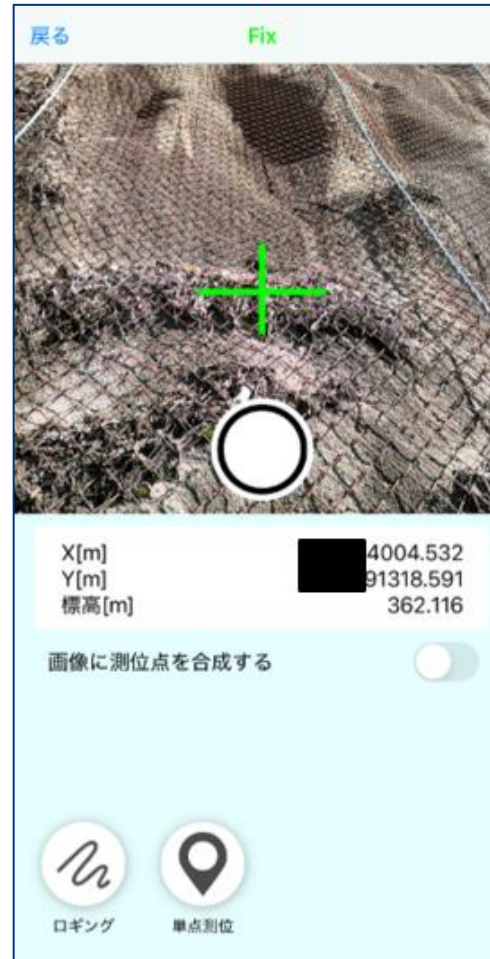


Don't hide your camera and walk around the outdoors about 6m with a view. It is recommended to walk without showing tiles that have the same pattern. Once the directional correction is complete, positioning can be performed indoors, and data can be acquired and viewed in the cloud. An error of about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



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.

### 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  
coordinates to the cloud

10-3 I want to upload boundary

10-4 I want to download the positioning results

10-5 I want to rename/delete/move group data

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

The screenshot shows the LRTK Cloud interface. The top navigation bar includes '位置データ一覧' (Location Data List) and a red box around the '追加' (Add) button. Below, there are sections for '位置情報追加' (Add Location Information) and '画像を重ねる' (Overlay Image). The '位置情報追加' section has a dropdown menu set to 'GeoJSON・SMAの平面直角座標系を選択' (Select Cartesian Coordinate System for GeoJSON・SMA). Below this are buttons for 'CSV', 'GeoJSON', 'SMA', and 'XYZ'. The '画像を重ねる' section has buttons for 'GeoJSON', 'LandXML', 'Shapefile', and 'Image'. A red box highlights the '3Dオブジェクトを追加' (Add 3D Object) button. A blue arrow points from this button to a detailed registration screen. The registration screen has fields for 'objファイル名' (Object File Name), 'objファイル(絶対座標付き)' (Object File with Absolute Coordinates), 'mtlファイル(任意)' (Optional MTL File), and 'objファイル設置座標(平面直角座標系:9系)' (Object File Placement Coordinates (Cartesian Coordinate System: 9 Series)). It also has a section for 'X, Y, Z' coordinates and a 'アップロードobjファイルの単位' (Unit of Uploaded Object File) dropdown.

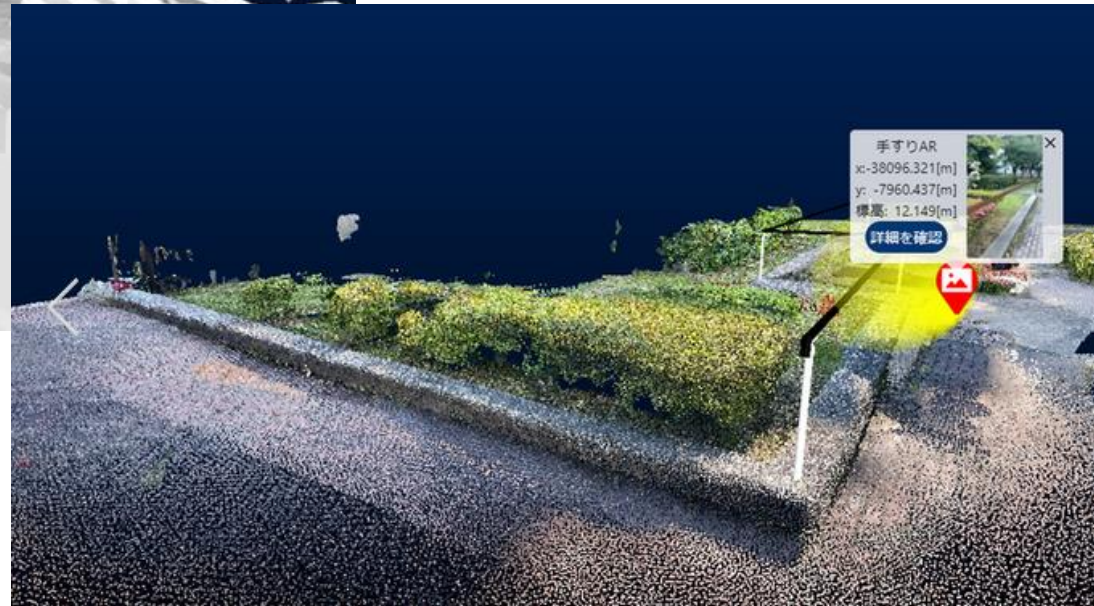
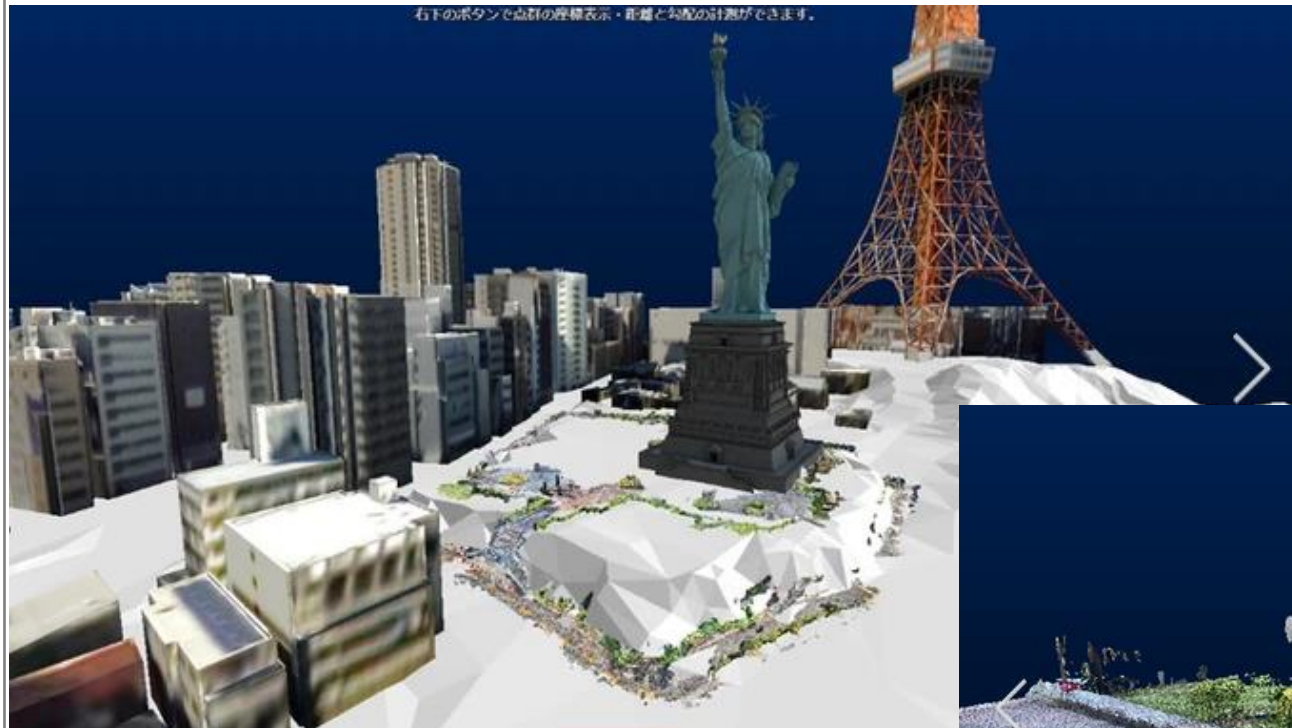
Select Add obj file from the Add button on the top left of the screen and register the obj file with absolute coordinates. You can change the coordinate axes on the registration screen. Obj files output in mathematical coordinate systems can be registered as is. Please set the axis so that it is located 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 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

右下のボタンで点群の座標表示・距離と勾配の計測ができます。



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

The screenshot shows the LRTK Cloud web interface. At the top, there's a navigation bar with the LRTK Cloud logo, a search bar, and several utility buttons: '3Dモデル作成を依頼する', 'ドローン測量を依頼する', 'LRTK端末を追加する', 'ニュース10/08(火)更新', a user profile icon with 'matsubara.t@lefixea.com', and a 'ログアウト' button. Below the navigation bar, there's a sidebar with '位置データ一覧' and a red-bordered '追加' button. The main content area is titled '位置情報追加' and '座標を追加'. It features a dropdown menu for 'csvファイル例のダウンロード' with a question mark icon, and a selection box for 'GeoJson・SIMAの平面直角座標系を選択'. Below these, there are eight upload options arranged in two rows of four. The first row includes: 'CSVをアップロードして位置情報を追加' (with a CSV icon), 'GeoJSONファイルをアップロードして位置情報を追加' (with a GeoJSON icon), 'SIMAファイル(CSV形式)をアップロードして位置情報を追加' (with a SIMA icon), and 'XY/緯度経度を手入力して位置情報を追加' (with a hand cursor icon). The second row includes: 'GeoJSONをgoogle mapに重ねて単点登録' (with a GeoJSON icon), 'LandXMLをgoogle mapに重ねて単点登録' (with a LandXML icon), 'シェープファイルをgoogle mapに重ねる' (with a shapefile icon), and '図面(画像ファイル)をgoogle mapに重ねる' (with a document icon). Below the second row, there's a section for '3Dオブジェクトを追加' with two options: 'objファイル(絶対座標付き)を位置データ一覧に追加' (with an obj icon) and 'LandXMLを位置データ一覧に追加' (with a LandXML icon). At the bottom, there's a section for 'グループを追加' with a button labeled '空のグループを追加'.

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.

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

The screenshot shows the LRTKクラウド interface. At the top, there's a navigation bar with options like '3Dモデル作成を依頼する', 'ドローン測量を依頼する', 'LRTK端末を追加する', and user info. The main area has a sidebar on the left with '位置データ一覧' and a '+追加' button. The central panel shows '位置情報追加' and '座標を追加'. It offers two methods: 'csvファイル例のダウンロード' (with a CSV icon) and 'GeoJSONファイルアップロードして位置情報を追加' (with a GeoJSON icon). The second method is highlighted with a red box and a blue arrow pointing to a map on the right. The map shows a yellow boundary area with pins. A red box on the map highlights the text 'ピンが表示された境界点を登録'.

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 screenshot shows the LRTK Cloud interface. On the left, a list of data points is displayed, including '群馬の現場' (Gunma Site), '1-5-10', '1-2-9-10', 'テスト', '点群2', '20241015', '20241012', '241015', '20241014', '20241013', '20240919', '20240903', and '240903つくば試験'. The 'ダウンロード' (Download) button is highlighted in the top left of the data list. The 'ダウンロード' dialog is open, showing a list of data points to be downloaded. The 'CSVダウンロード' (CSV Download) option is selected, and the 'ダウンロードする' (Download) button is visible at the bottom right of the dialog.

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 screenshot displays the LRTK Cloud web interface. On the left, a map shows a building with several red location pins. The main panel is titled '点1' (Point 1) and contains a table of coordinates and other data. The table has columns for '項目' (Item) and '値' (Value). The data is as follows:

| 項目             | 値                   |
|----------------|---------------------|
| 測点             | 点1                  |
| 測点タイプ          | 単点測位                |
| 日時             | 2024/10/10 15:14:41 |
| 緯度             | 35.66097196         |
| 経度             | 139.73674637        |
| 標高(JGD2011)    | 43.425              |
| 標高(WGS84)      | 0.000               |
| ジオイド高(JGD2011) | 0.000               |
| ジオイド高(WGS84)   | 0.000               |
| X              | -37609.090          |
| Y              | -8744.885           |
| 平面直角座標系        | 9                   |
| RTKステータス       | notSurvey           |

Below the table, there is a 'メモ' (Memo) section and a '写真' (Photo) section. To the right of the main panel, there is a '位置データ一覧' (Position Data List) section. It shows a list of selected items (15 items) with checkboxes and buttons for 'ダウンロード' (Download), '共有' (Share), '移動' (Move), '座標系作成' (Create Coordinate System), and '削除' (Delete). The list includes items with IDs like 20240919, 20240829, test, and 20240903.

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.**



六本木オフィス:  
〒106-0032  
東京都 港区 六本木  
5-17-6-403

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



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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



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

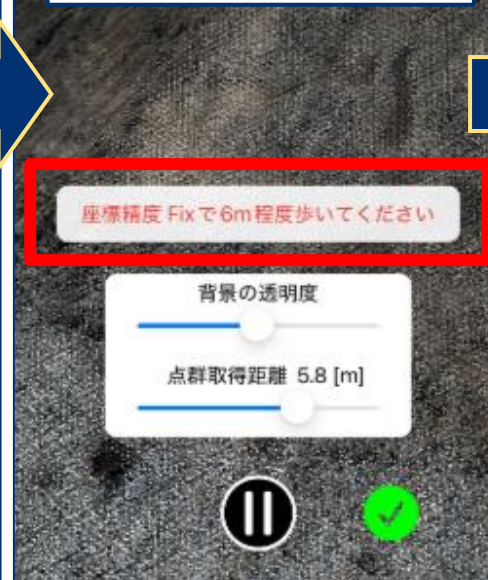
Press Point Cloud Scan.



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.





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



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



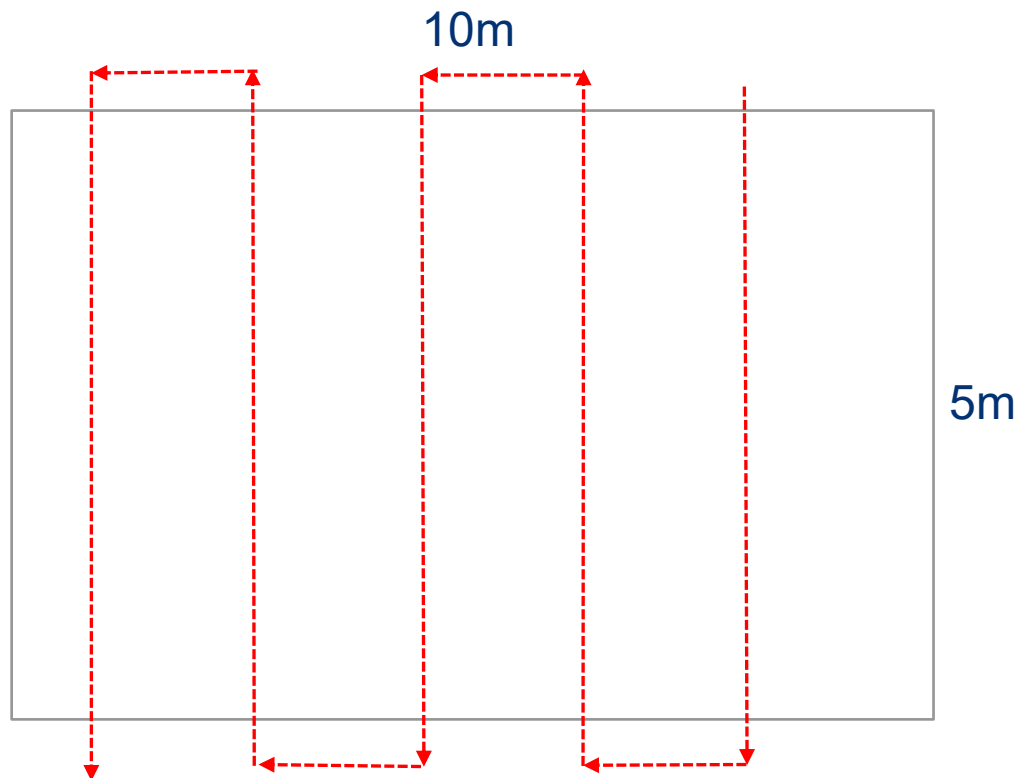
Target (ground)



Target (structure)

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

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  - 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 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

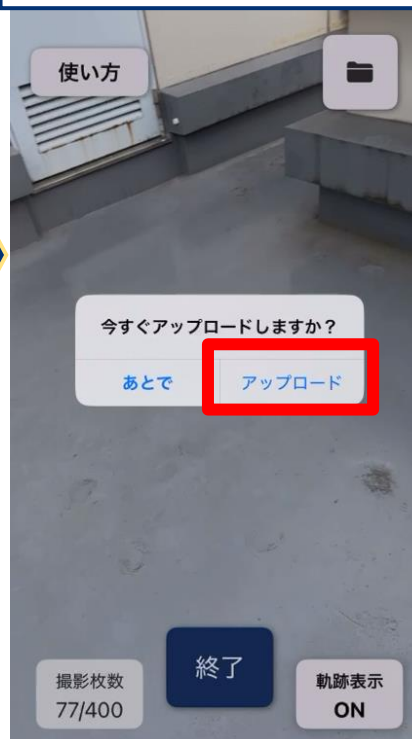
Press Details Point Cloud Scan.



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

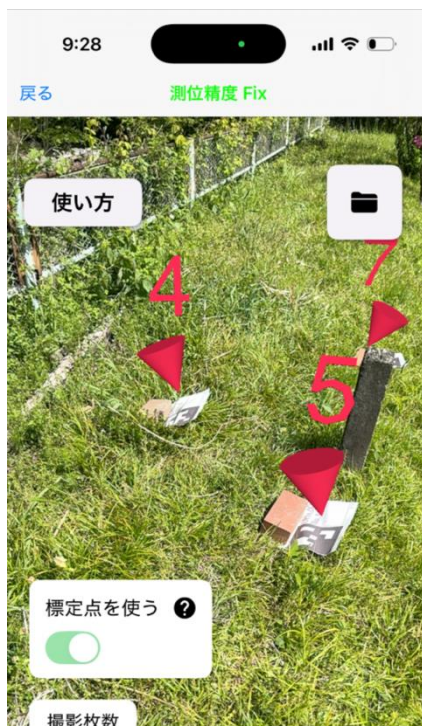


You can download the orientation point from the button above the LRTK cloud. By printing and using it, Improves absolute coordinate accuracy for point clouds generated by detailed point cloud scans.

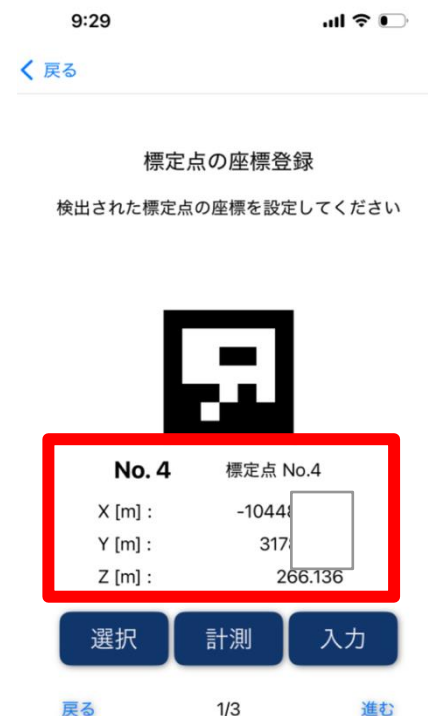
## How to use the alignment point



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.

## Three point cloud scan techniques exist

- 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)
- 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
- 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 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.

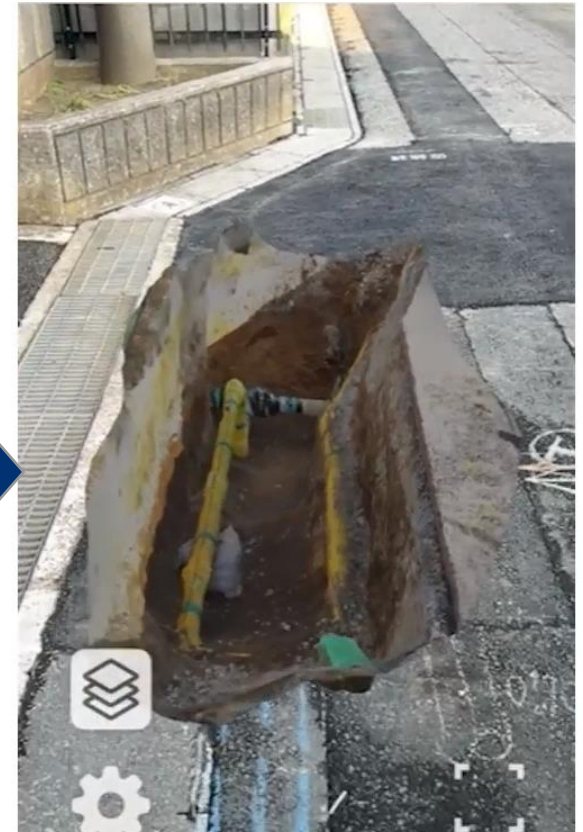
### Structure scan: Where to use



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.



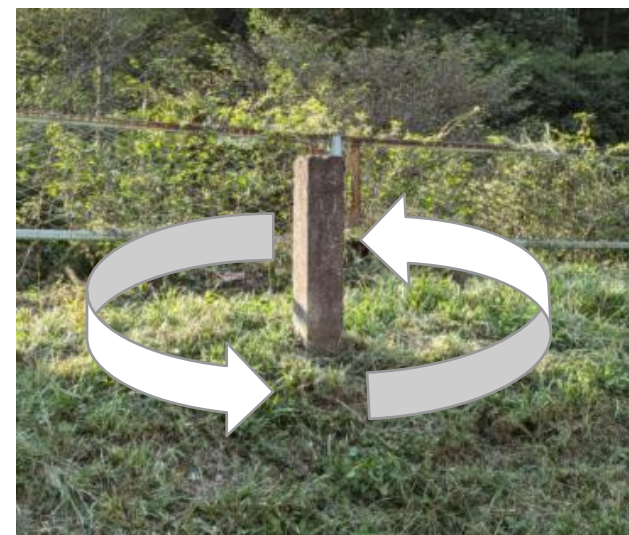
By using the structure scanning function, you can create high-precision 3D files with absolute coordinates. You can view the created 3D files from the data list.

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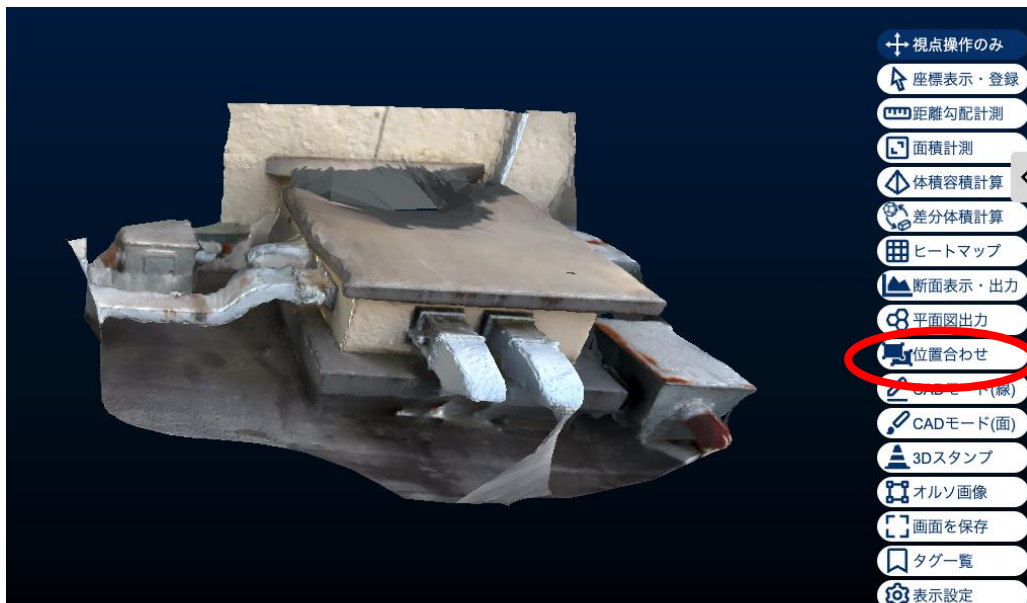
電話: 03-6456-4323  
URL: <https://lefixea.com>



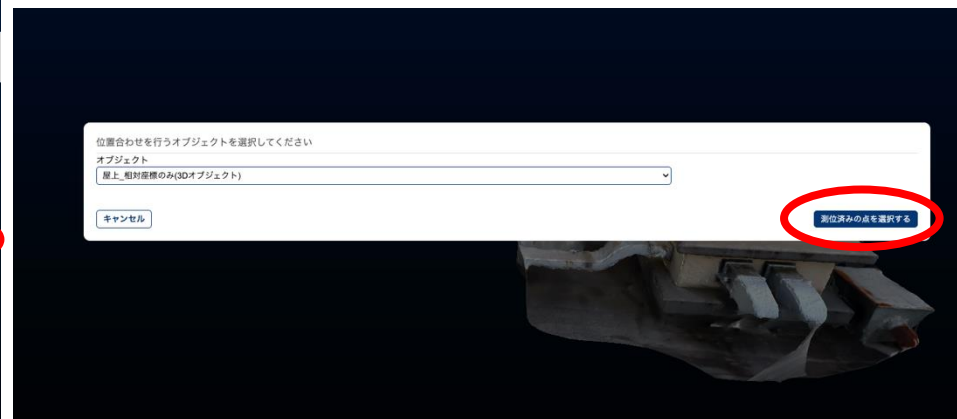
You can assign correct absolute coordinates to point clouds that have a bad system of absolute coordinates, or to 3D files with only relative coordinates. Open the registered 3D file and press Align.

## 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.

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.



3Dオブジェクトの座標を入力

3Dオブジェクトの移動先の座標を入力してください。

| Point | X      | Y     | Z      | → X        | Y         | Z      |
|-------|--------|-------|--------|------------|-----------|--------|
| 点1    | -0.703 | 0.802 | 0.571  | -37598.78  | -8748.061 | 44.172 |
| 点2    | 1.172  | 0.314 | 0.569  | -37598.318 | -8749.849 | 44.238 |
| 点3    | 1.220  | 0.334 | -0.179 | -37598.272 | -8749.937 | 43.514 |

☐ モデルを傾ける(X,Y軸中心に回転させる)

キャンセル

位置を合わせた3Dオブジェクトを作成する

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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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.



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

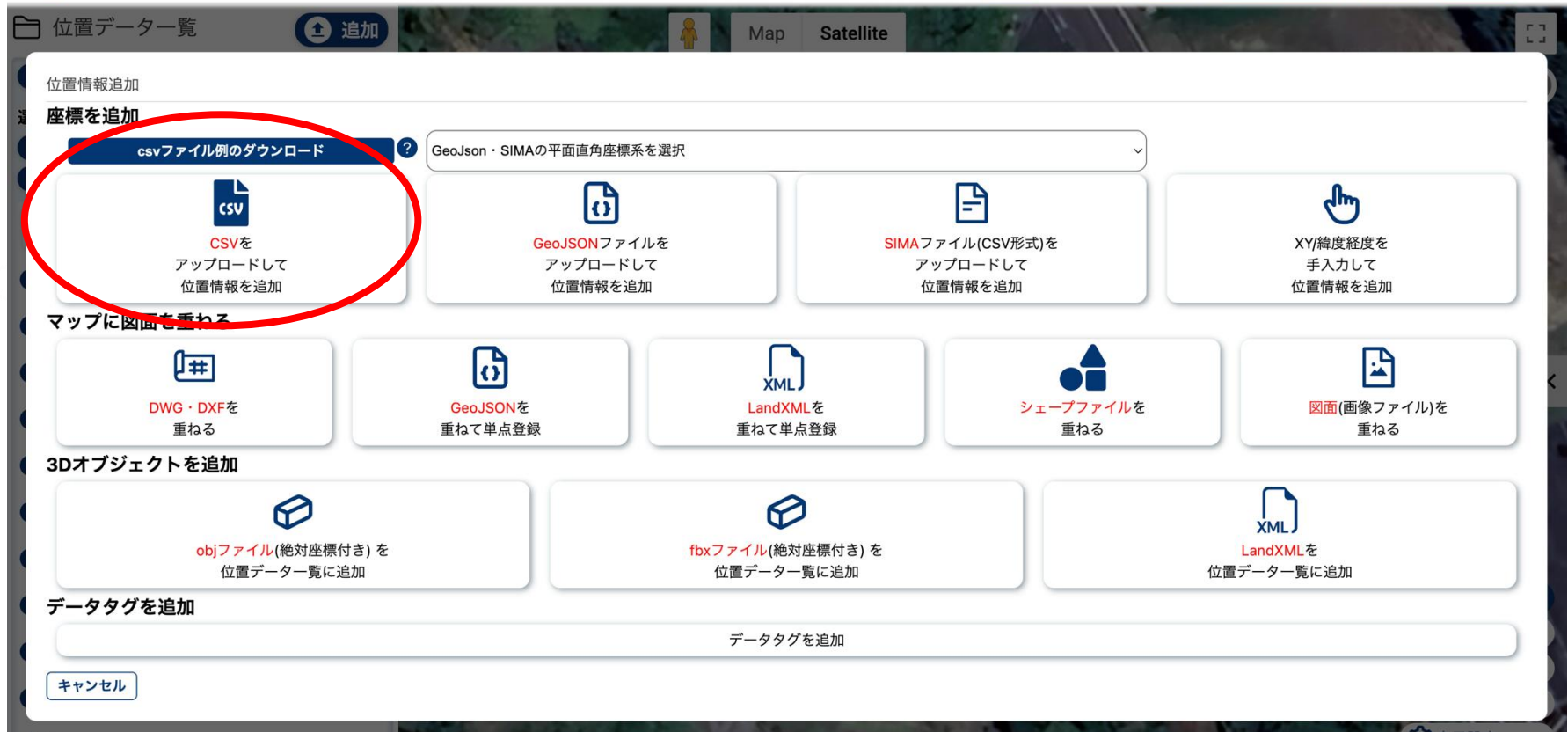
| X座標[m]    | Y座標[m]     | 平面直角座標系 | 標高(JGD2011)[m](任意) | グループ名(任意) | 測点名(任意) | タグ(任意) |
|-----------|------------|---------|--------------------|-----------|---------|--------|
| 34863.883 | -71615.847 | 15      |                    |           |         |        |
| 41976.742 | -72828.556 | 15      |                    |           |         |        |
| 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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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.