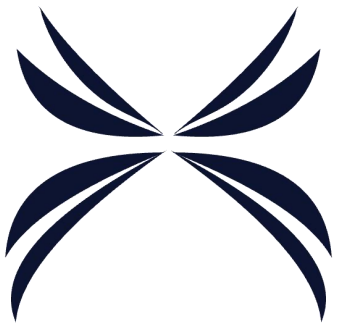


LCC Studio

User Manual

2025.04

V1.7.0

Contents

Lixel CyberColor Studio User Manual - v1.7.0

Lixel CyberColor Studio User Manual - v1.7.0

I.Lixel CyberColor Studio Software Description

LCC-Lixel CyberColor is a **photorealistc 3D model rendering method** derived from 3D Gaussian Splatting. It integrates laser and visual data collected by Lixel series scanners to reconstruct and render, generating 3D models with rich details. The model is currently stored in .ply format, but unlike traditional point clouds, it cannot be cropped or edited. Due to the better generation efficiency and effect of technologies similar to 3DGS than mesh modeling and photogrammetry, it is currently very popular in the 3D industry and related upstream and downstream industries.

The advantage of LCC compared to similar technologies on the market is:

1. SLAM-based 3DGS can obtain a larger range of spatial data through mobile collection, with higher efficiency
2. Laser data is obtained during collection and also participates in calculation, so the generated model structure is more accurate and clear, and can be used for measurement and other spatial calculation-based superposition applications based on this data
3. Fast generation speed (5 minutes data → current generation time 100-150 minutes, about 1:20-30)
4. The data is small (1/5 of the same type of data).
5. Good scalability (measurable, annotated, editable, and further development)

Lixel CyberColor Studio (hereinafter referred to as LCC Studio) is a **tool for rendering and generating LCC photorealistic models on the local PC** . After importing the laser and visual data collected by Lixel series scanners, after automatic processing, it can generate 3DGS models in general format (.ply) or proprietary format (.lcc). Users can view it locally or publish the model online and share it with other users in the form of web link for viewing and nevigating.

Core Function:

1. Generate: Use Lixel series scanners to collect spatial data and generate LCC model results with one click in Studio.
2. View: you can locally view and navigate the model results of LCC and PLY in Studio.
3. Publish: the LCC results can be published as a link that can be viewed on the web with one click.
4. Export: export .ply's general format and .lcc format.
5. Measurement: Supports distance measurement and area measurement based on the

result.

6. Notes: Different kinds of note information can be edited and viewed.
7. Clipping Box: Supports internal and external clipping.
8. Portal: Editing portals for multiple space navigation is available.
9. Save As: Supports saving the cropped content in the common .ply format and the proprietary .lcc format.
10. Collision: Supports generating LCC data with collision, allowing you to experience the effect of collision in the scene.
11. Asset Overlay: Supports importing .fbx and .glb 3D models into the LCC scene model.
12. Spatial Exploration: Supports recording the exploration of the 3D space and rendering it into a video file.
13. Map Fusion: Supports uploading multiple data segments at once and efficiently stitching them into a complete scene through an automated processing workflow.

II. Version and Copyright Notice

1. Version Description

Software Version: Lixel CyberColor Studio 1.7.0

Version Release Date: April 2, 2025

This manual is based on LCC Studio V1.7.0 version. The operation of other versions may be different. Please confirm the software version before use.

2. Key New Features★

- **Studio Account Settings Interface and Features Upgrade**:

- Added Advanced section with more configuration options
- New About section for easy access to version information and updates

- **Real-time Memory Peak Monitoring**:
  - LCC will dynamically estimate memory usage when creating reconstruction tasks
  - Visual progress bar helps users plan resources

- **Publishing Feature Upgrades**:
  - Create custom URLs for published projects
  - Protect published links and control access
  - Cloud-based management of all published links

- **Measurement Operations Upgrade**:
  - Added "Pro Measurements" option for distance measurements, displaying offset distances (dx, dy, dz) between points
  - Support for secondary point adjustment to improve measurement precision
  - Enhanced magnifier with dynamic background recognition for better visibility

Notes:

III. Software Installation and Registration Login

1. Installation package download

Download the software through the official website.

For LCC Studio V1.7.0 access, contact your sales manager with your registered account information to activate your license.

https://xgrids.com/download

2. Recommended Installation Environment

Operating System Support : Windows 10 /11 Professional, Home

Hardware basic configuration :

Currently, there is no absolute minimum limit for CPU, but try to use a mainstream product after 2017. And thus we require that your CPU should be

1. Intel i7 8700K or above
2. AMD R7 1700X or above

GPU：

Combining with video memory requirements, some suitable graphics cards include:

Server V100 graphics card (16GB memory), **A10 graphics card (24GB memory), A100 graphics card (48GB memory)**

Desktop 2080Ti graphics card (11GB memory), 3060 graphics card (12GB memory), 4080 graphics card (16GB memory), **3090 graphics card (24GB memory), 4090 graphics card (24GB memory)**

Laptop 3080Ti graphics card (16GB video memory), 4080Ti graphics card (16GB video memory).

Recommended configuration :

CPU：Intel i7 8700K

GPU: Graphics card 3070 and above included

Memory: 64G

(1) The Impact of GPU Performance on Processing Efficiency

Take RTX4090D and 3060 as examples:

- **High-end GPUs (e.g., 4090D)**

- Provide faster processing speeds, especially when handling high-resolution and large-scale point cloud data.
- Maintain high processing efficiency under large data volumes, reducing waiting times.
- **Mid-range GPUs (e.g., 3060)**
- Suitable for processing point cloud data of standard sizes.
- Processing efficiency is lower than high-end GPUs when processing large datasets, but performance remains stable.

(2) Memory and Data Processing Capabilities

Taking 64GB and 128GB as examples:

- **64GB Memory:**

Capable of stably processing up to 30 minutes of scanning data.

Processing more than 50% above this limit (e.g., over 45 minutes of data) may lead to processing failure.

- **128GB Memory：**

Supports stable processing of up to 60 minutes of scanning data.

Processing more than 50% above this limit (e.g., over 90 minutes of data) may increase the risk of reconstruction failure.

(3) Recommended Configuration for Map Fusion

The Map Fusion feature requires higher hardware configurations to support multi-map automated merging and compute-intensive processing. To ensure system performance and meet the demands of high-volume data processing and multitask automation, we recommend the following configuration:

Recommended Configuration:

- **Processor:** AMD Ryzen 9 9950X or an equivalent 16-core processor and above.

- **Memory:** 64GB DDR5 (96GB or 128GB recommended for larger datasets).
- **GPU:** NVIDIA RTX 3090 (RTX 4090 or 4090D recommended for optimal performance).

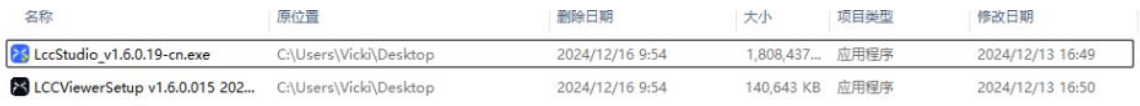
Notes:

- Before starting a project, ensure that your computer resources are sufficient to avoid interruptions or failures.
- For large models (total length ≥150 minutes) requiring high-quality reconstruction, 96GB to 128GB memory is recommended. If memory is insufficient, opt for **Medium Quality** processing to ensure a smoother process.
- Processing time varies. Under the recommended configuration, with **Medium Quality**, processing time can be estimated at a 1:20 (i.e., 20 minutes processing time for every 1 minute of collected data).

Please configure your system according to these recommendations to ensure efficient operation of the **Map Fusion feature.

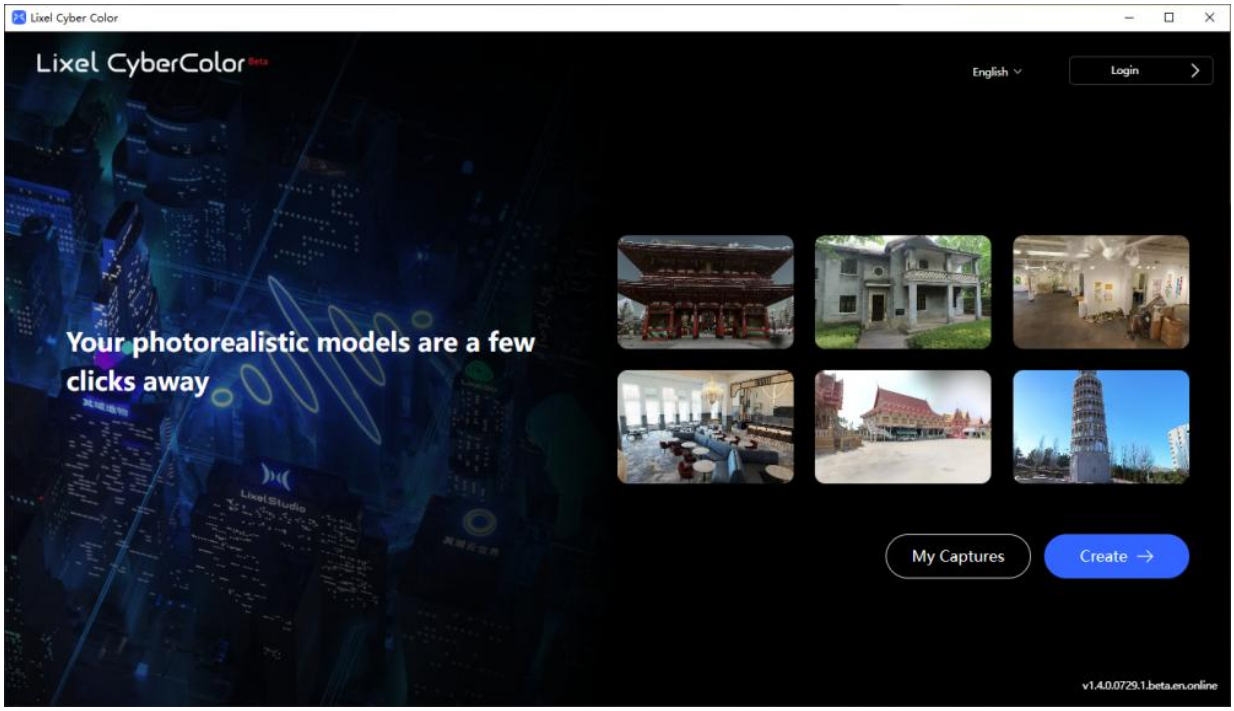
3. Installation

LCC Studio is installed and used in the form of an EXE installation package.

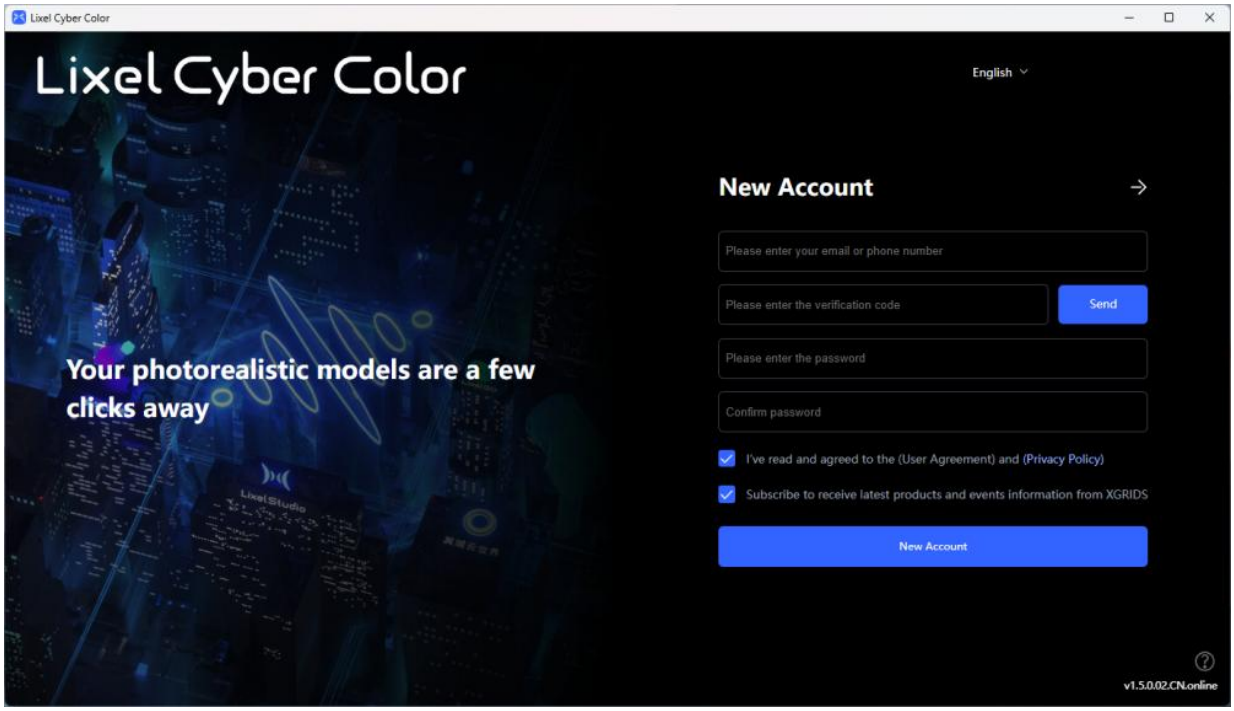


4. Registration

Click "Create" to enter the login/registration page



Click "Register Account" to enter the registration page, fill in the information, and click "Register" to complete the registration and login

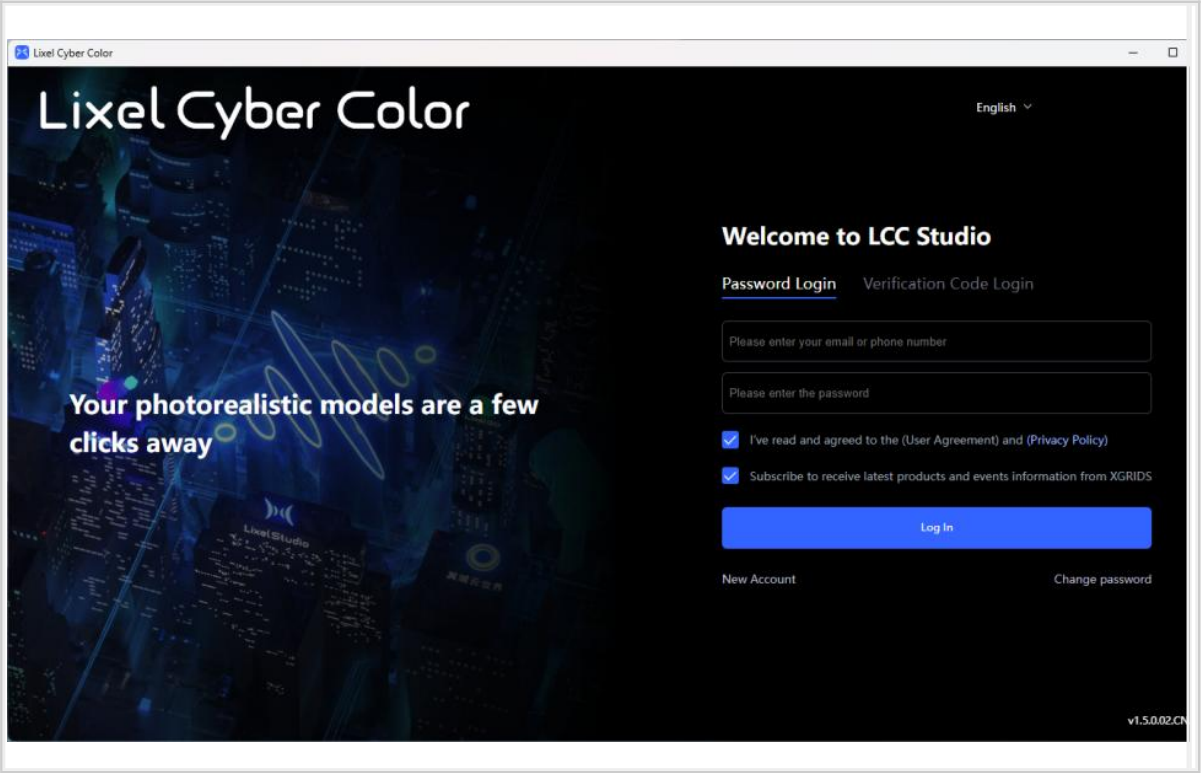


Subscribe to XGRIDS product and event updates: By selecting this option, you successfully subscribe XGRIDS newsletters including product and event information to your email.

If you wish to unsubscribe in the future, you can select the unsubscribe option in the promotional email, and you will no longer receive information related to XGRIDS.

5. Login

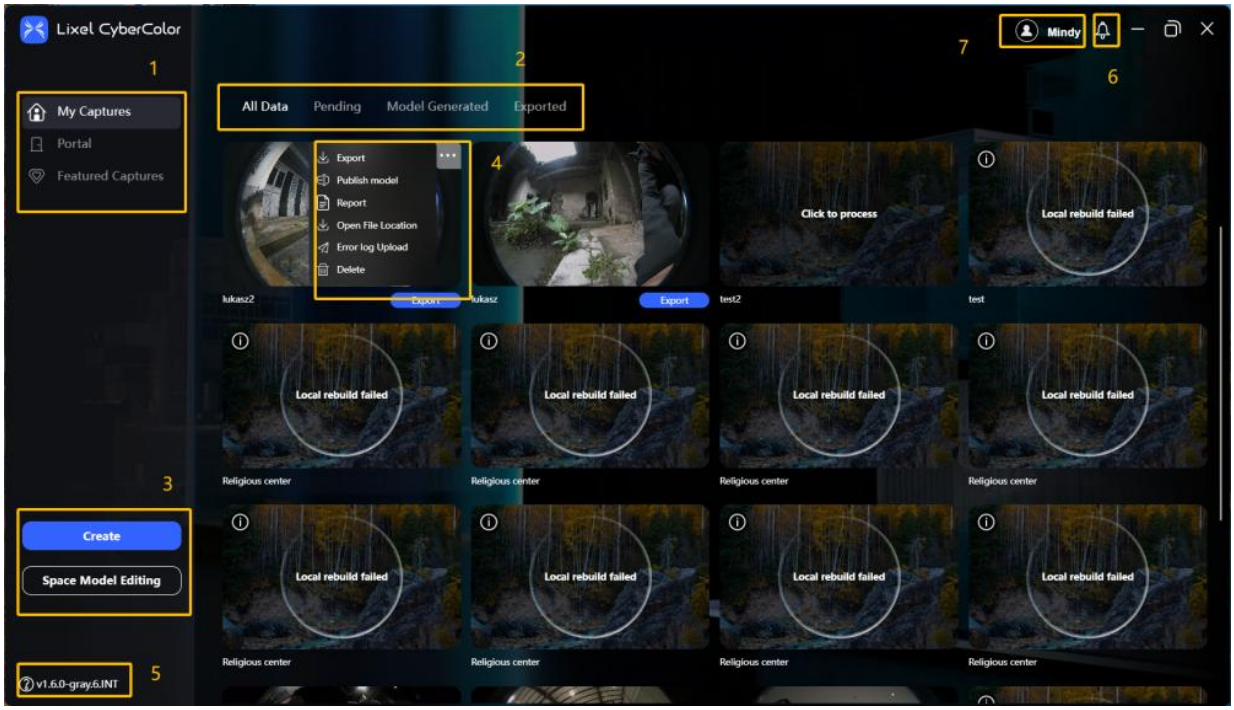
Default password login can be switched to verification code login. After logging in, enter the main interface of LCC Studio software.



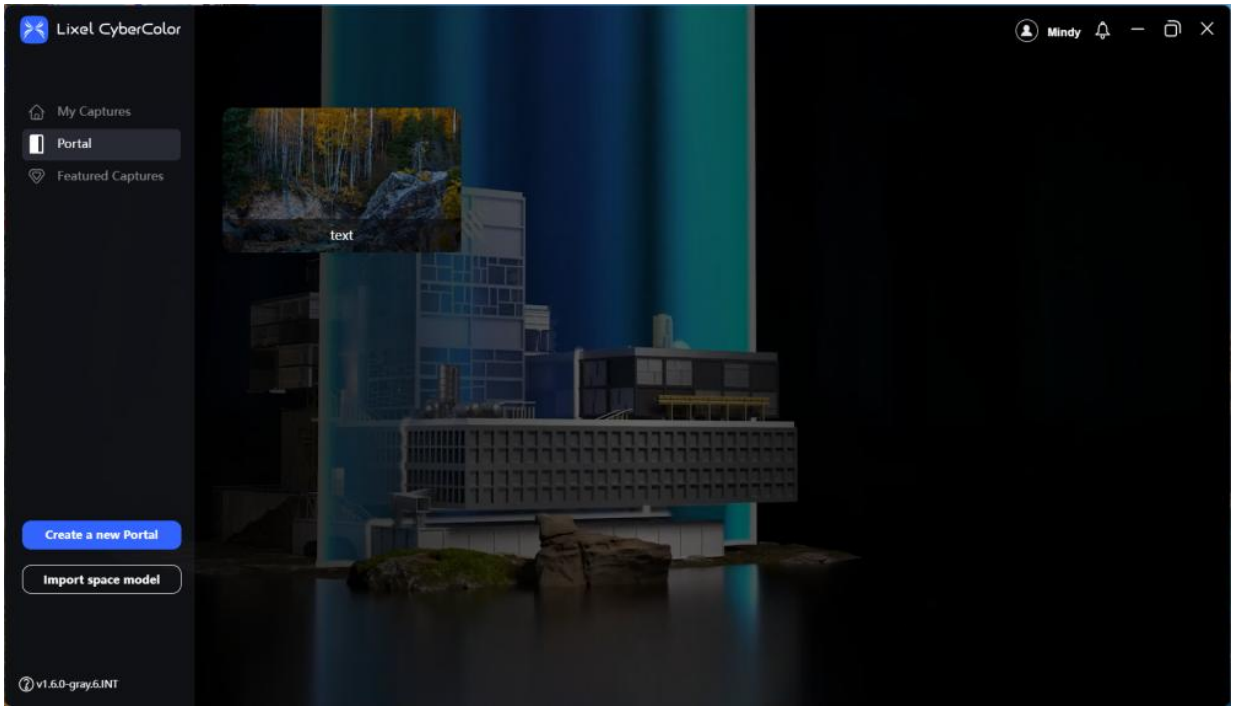
IV. Introduction to software interface

1. Scene data generation and management

My Capture



Portal



(1) Scene type

LCC Studio has divided users into three major scene types: "My Captures", "Portal", and "Featured Captures".

My Capture

- This area contains all LCC model data created and uploaded by users themselves. Users can view, edit, and manage personal projects here.

Portal

- Users can select "**Creat a new Portal**" from the "**Portal**" interface in LCC Studio to create an integrated portal project for managing and quickly accessing multiple LCC models. In addition, users can import jump scene files in .lct format to view and edit the set project with portals.

Note: Only editing portal functions are supported in the portal interface, other editing functions will be disabled to ensure focus on portal settings.

Featured Captures

- In the "Featured Plaza" interface, users can view the featured use cases selected by the LCC team online. This is a platform to showcase excellent works and gain inspiration. Users can view the splats online or pre-cache it locally in offline mode for convenient browsing anytime.

(2) LCC data Management

The latest version improves data organization:

All Data

- Contains all data categories and project statuses: in reconstruction, export, publish, and paused

Pending Reconstruction

- Includes failed reconstructions, pending tasks, in-progress, and paused reconstruction data

Generated

- Contains all successfully reconstructed models
- Note: Clicking any model in "Generated" opens the editing panel by default. Use "View" in the model menu for view-only access

Recently Accessed ★

- Tracks all models browsed in the software, differentiating between .lcc and .ply formats

Model Generation and Editing

- **Create**: Start a new LCC model by clicking the "Create" button
- **Model Editing**: "Import Model" is updated to "Model editing". Import .lcc and .ply files into Studio for editing.

(3) Project Settings

Access the "..." menu in the upper right corner of each project:

- **Data in Reconstruction**: Pause, Delete, Upload Error Log
- **Generated Data**: Publish, Export, Report, Open File Location, Upload Error Log, Delete

- **Published Data**: Publish, Publish Management, Export, Report, Open File Location, Upload Error Log, Delete

Publishing ★

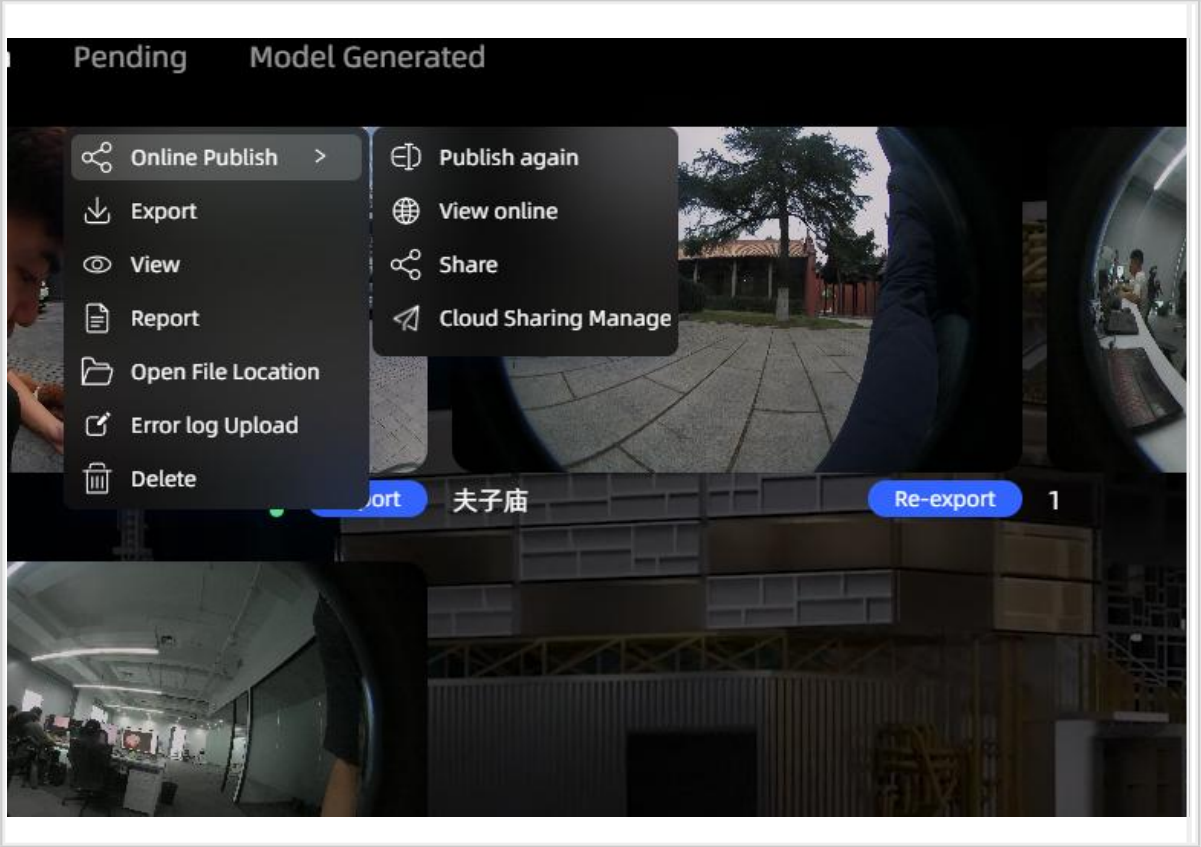
Share scenes with others with or without password protection:

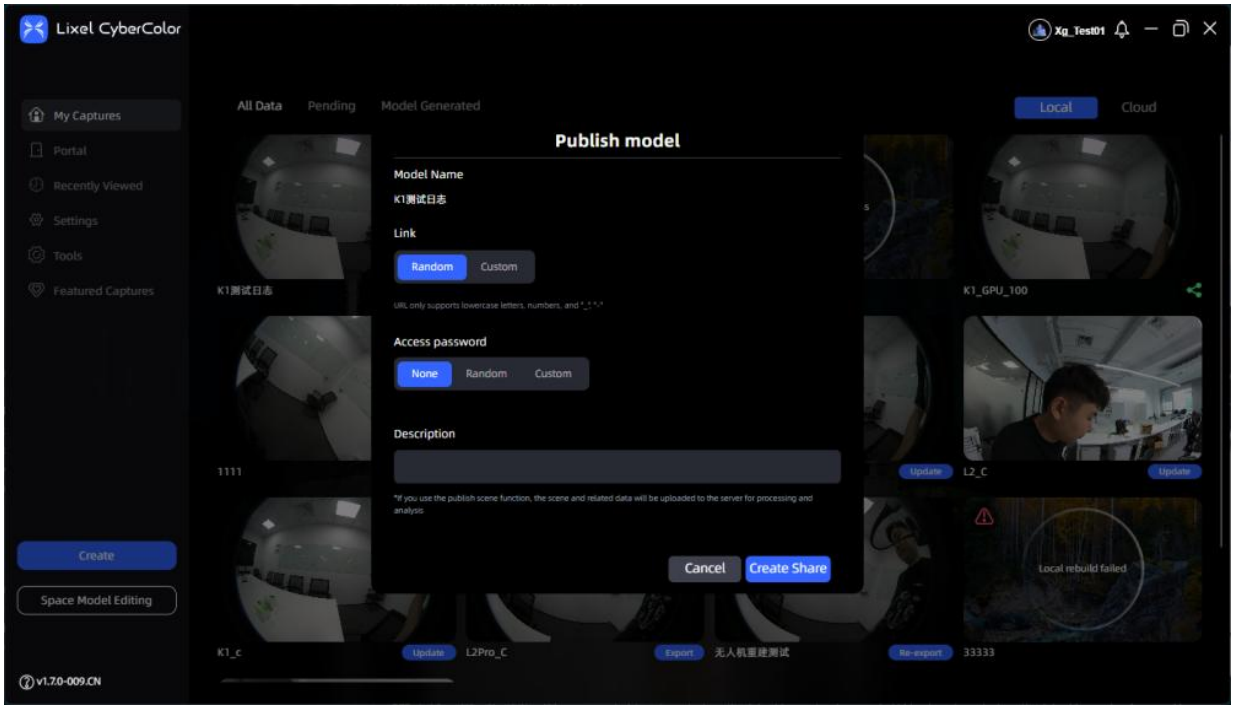
- **Public Sharing**: Anyone with the link can access without password
- **Password-Protected Sharing**: Only authorized users can access
- **Description**: Add brief explanations about content or purpose
- **Share**: System generates a shareable link

Publishing Management ★

Cloud-based dashboard for published content:

- **View All Published Links**: See statuses and descriptions
- **Edit Publishing Settings**:
    - Customize URL
    - Toggle password protection
    - Update access password
    - Edit scene descriptions
- **Activate/Deactivate Links**: Control when links are publicly accessible





Report

LCC Studio supports users to view detailed data reports for each locally generated model. Users can obtain detailed information about the LCC generated model through this feature.

Upload Error Log

If the generation project encounters any problems, users can directly upload logs to the LCC team through this function. You can choose to upload log files with relevant durations. To ensure that the problem can be accurately diagnosed, please make sure that the log file contains key information before and after the problem occurs, which will help the LCC team diagnose the problem faster and provide solutions.

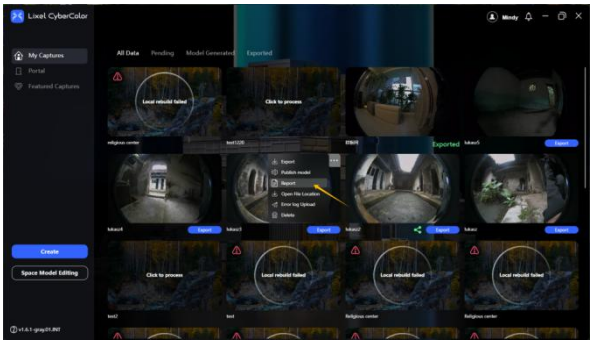
Export

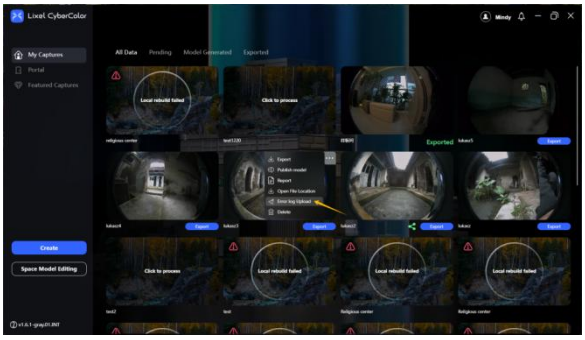
LCC Studio supports exporting model as 3DGS data in different formats, including .lcc data result files and .ply format standalone data files. The export process allows us to remove watermarks in the LCC model.

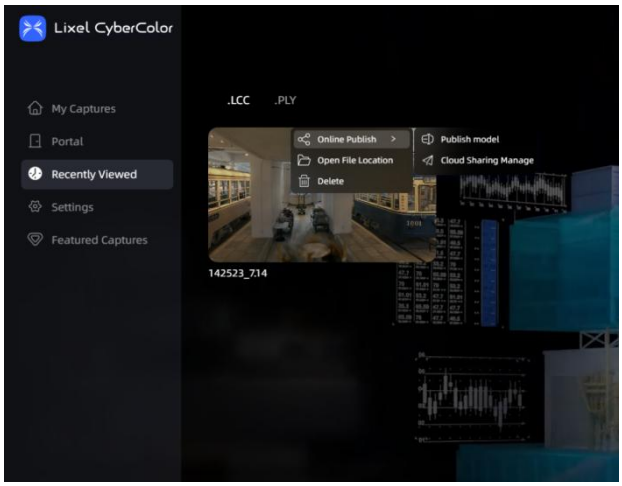
- **.PLY format** :
    - Conventional 3DGS format file, suitable for other open source 3D Gaussian viewers.
    - It can be imported and processed through 3D Gaussian plugins from other UE or Unity ecosystems.
    - Users can choose to export PLY files with different precision or export all PLY files.
- **.LCC format** :
    - Export as a set of file data containing .lcc format files.
    - When exporting, you need to create a new folder to store these files and rename the folder.
    - Features: LCC format files are compressed by 70% -90% compared to conventional formats, making them easier to store, view, and apply.
    - It can be combined with XGRIDS LCC Unity or Unreal Engine developer toolkit to achieve further development on these mainstream engines.

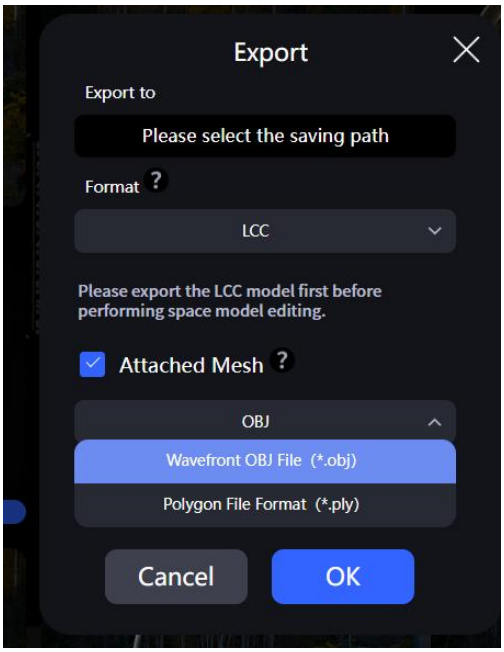
It also supports exporting Mesh files along with LCC splats when exporting results. The Mesh file is a triangular mesh model file, widely used in 3D modeling and rendering workflow. Currently, the Mesh file does not include texture and supports only .obj and .ply formats.

Click "OK" to complete the export.









(4) Help and version information

- **User Manual** : Users can directly jump to the current version of the user operation manual by clicking the "Help" button. Detailed operation guides and FAQs are provided here so that users can quickly master the use of the software.

- **Software version information** : In the lower left corner of the interface, we display the current LCC Studio software version information. This helps users understand the software version they are using and provides accurate version reference when technical support is needed.

(5) Notice

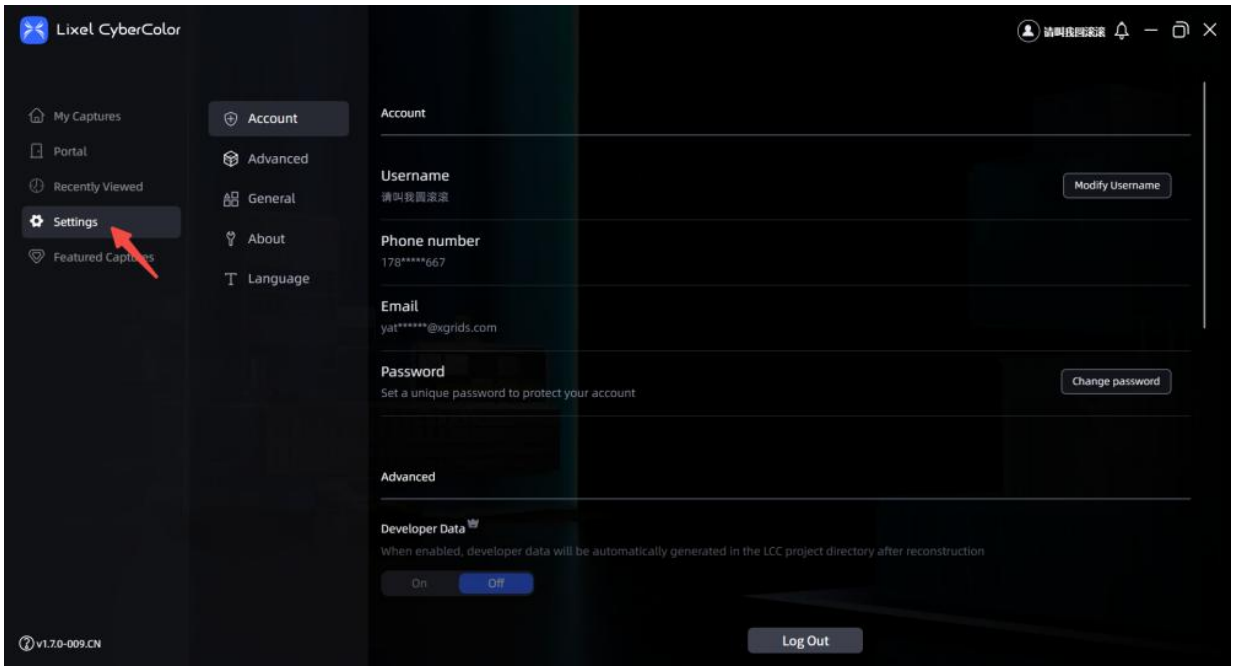
- **Important notes and system answers** : Through the announcement function, we convey the latest important notes about LCC to users, including software updates, feature changes, and systematic answers to some common user questions. This helps users stay informed of the latest software developments and provides timely help and guidance.

(6) Account information display

- At the top of the LCC Studio interface, the user's profile picture and username will be displayed intuitively. Click to quickly jump to account settings.

2. Account Settings

Access via the top-right corner or side menu "Settings":



- **Account**:
  - **Change Username**: Update your display name in LCC
  - **View Binding Information**: Manage phone/email
  - **Change Password**: Update account security

- **Advanced**: Configure LCC professional features and parameters
- **General**:
    - **Set Project Path**: Choose storage location for reconstruction data
- **About**: Access version information, installation links, and tutorials
- **Language**: Switch between Chinese, English, and Japanese

Note:

- **Language:**

If the language is changed during editing or viewing, simply re-enter the space and the language setting will take effect.

- **Project Directory:**

Before starting to use LCC Studio for processing, it is strongly recommended that users set the project storage path first, distinguish the LCC data storage location from the software installation directory, and recommend setting the directory on the solid state drive (SSD). This can significantly improve the efficiency of data generation and processing.

V. Function usage process description

1. Data Acquisition

Before using LCC Studio for 3D model generation, you must first use the Lixel series scanner for a comprehensive scan.

Note:

Due to the map fusion feature of LCC Studio, there are specific specification requirements for Data Acquisition. Therefore, when scanning, please strictly follow the acquisition guide to ensure that the data meets the requirements. In addition, there are some additional details to pay attention to for RTK Data Acquisition to ensure the quality and applicability of the scanned data. Please refer to the relevant acquisition guide and quick use guide for more detailed operation instructions.

https://d1hl53kddblsn9.cloudfront.net/lcc/doc/help/LCC+Scanning+Guideline+v3.0.pdf

LCC Quick Start

https://www.youtube.com/watch?v=VVUPbxSz5l4&t=84s

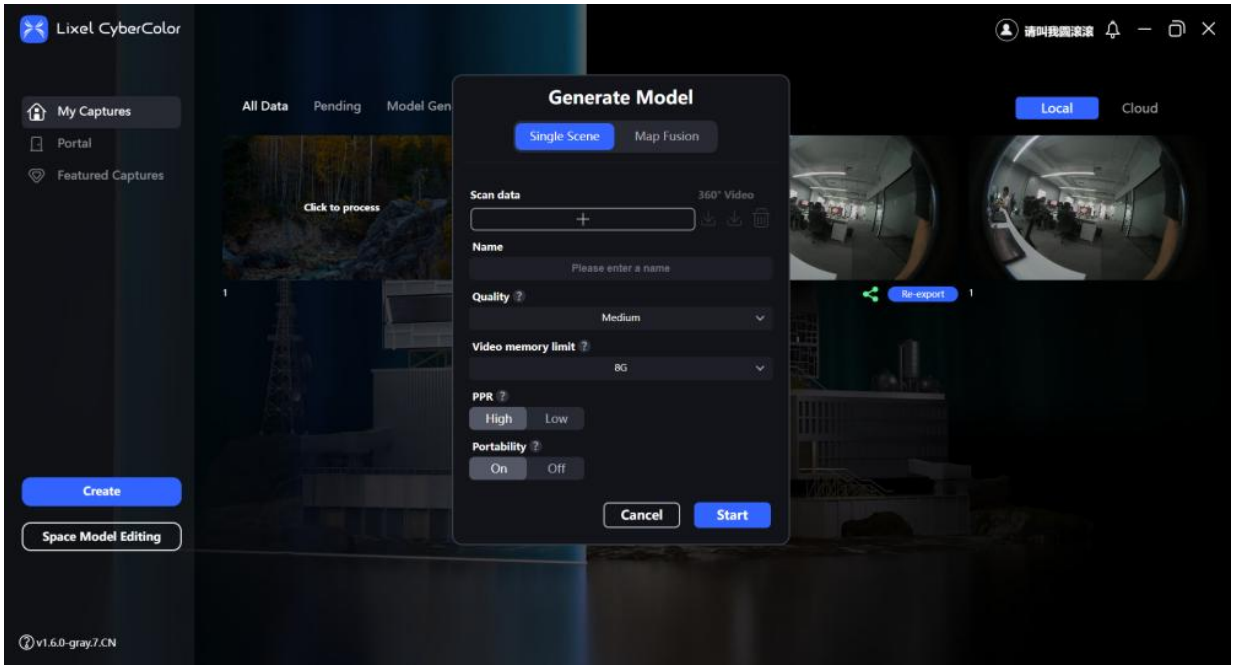
Support for LCC splats with Absolute Coordinate Information

LCC files generated from data collected with RTK devices now support the inclusion of absolute coordinate information, with default support for the two most commonly used coordinate systems: CSCS2000 and WGS84. Users can apply these files to geospatial platforms (such as the Cesium system) for 3D visualization. Developers can log in to the XGRIDS Developer Platform to access the Web SDK documentation for detailed operational procedures and integration guidance.

https://developer.xgrids.com/#/document?titleId=en-1720509291851

2. Model generation

Click "Creat", the interface of "Generate Scene" will pop up. According to the user's reconstruction needs, it can be divided into single scene reconstruction and map fusion reconstruction (also known as multi-scene automatic splicing). Model reconstruction can be carried out according to the interface process instructions.



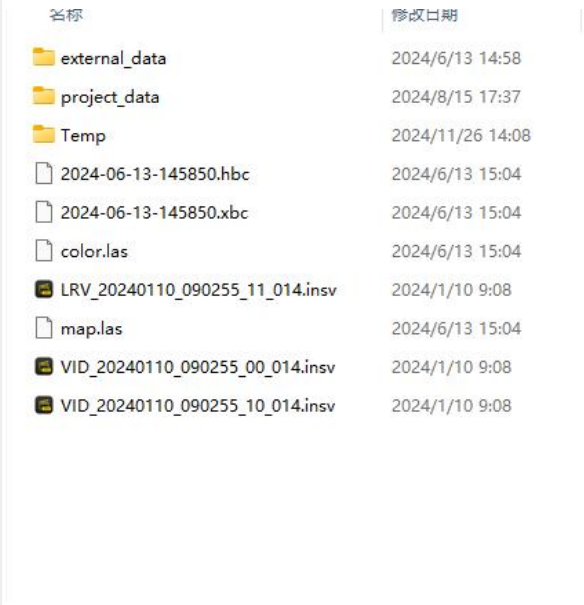
(1) Single model

In LCC Studio, the process of creating a single scene is divided into two steps:

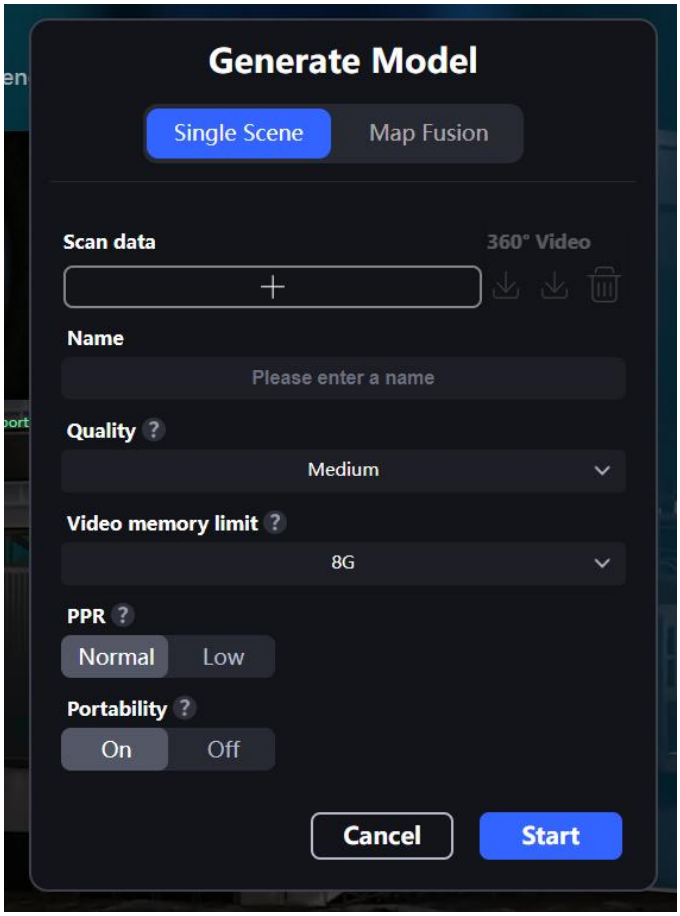
Step 1: Upload scanning data

- **Scanning data:**

Users upload data files scaned by Lixel series scanners, and the interface will display the corresponding device type.



Scanner data



Display device type

- **360 videos:**

For panoramic cameras equipped with Lixel L1, L2 devices, the "Panoramic Video" upload option will be activated. Users should upload video files corresponding to the collected data.

Note: After the data of the Lixel K1 and Lixel L2 Pro devices is uploaded, there is no need to upload panoramic videos. The panoramic video upload option will not be available (the function bar is grey out).

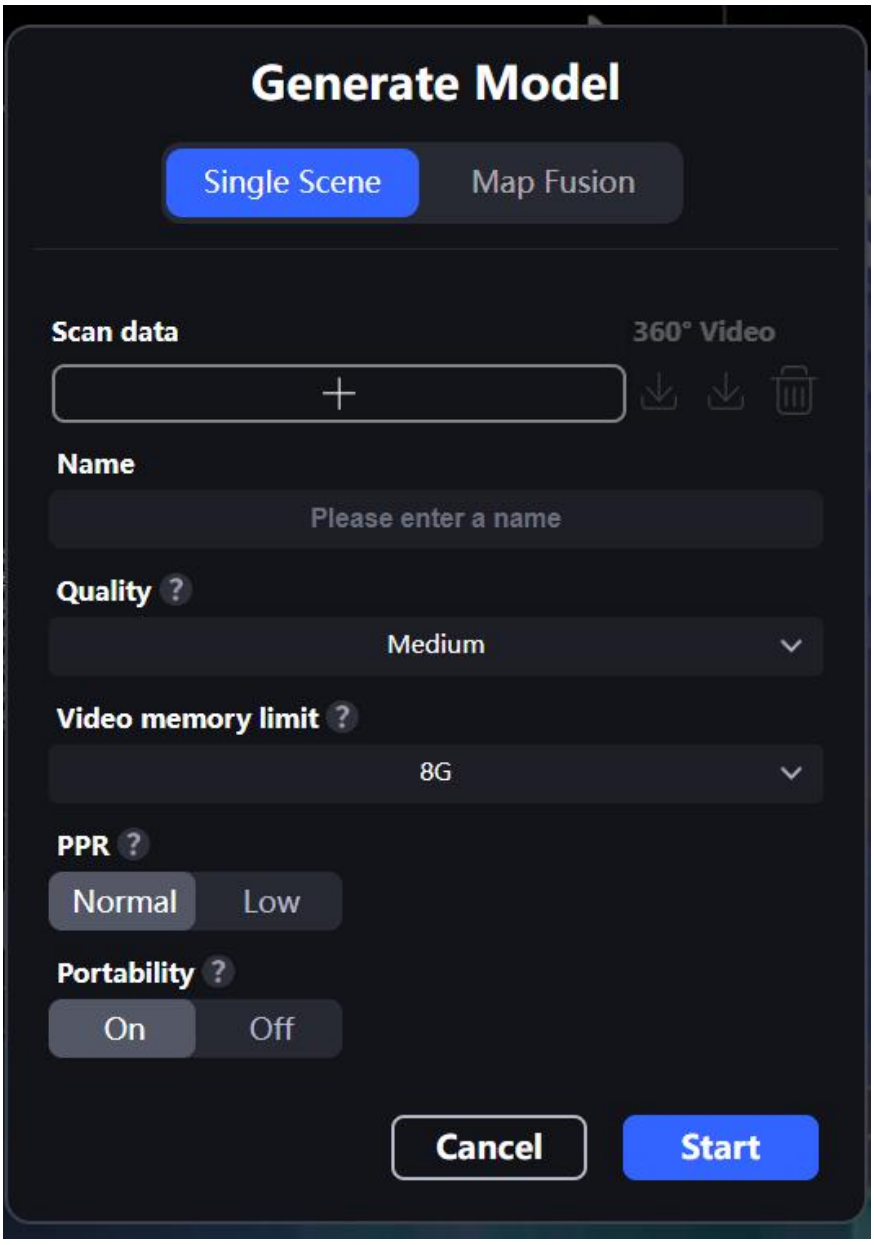
Step 2: Fill in the project name and set the parameters .

- **Name :** Specify a scene name for the LCC scene created.
- **Quality** : Choosing different parameter levels (high, medium, low) can generate models with different signal to noise ratios. The generation of high-quality models will significantly increase the consumption of video memory. Although this will prolong the time of model generation, you will eventually get better model results.
- **Video memory upper limit**: According to the computer's video memory capacity, you can choose the appropriate video memory upper limit to optimize the model generation process. The higher the video memory capacity, the more points the model generates, but the corresponding generation time will also increase. When choosing the video memory upper limit, the required video memory capacity for scanning the model should be considered to ensure the best balance between generation efficiency and model quality.
- **PPR（Point cloud Participation Rate）**:If sky adhesion occurs (such as at the edges of trees or buildings), try rebuilding and lowering the PPR.

Note: Adhesion is typically caused by a single viewpoint during data collection. It is recommended to collect additional angles and heights for the best results.

Before lowering (normal)	After lowering (low)

- **Portability:** Allow users to generate LCC models that are compatible with most of compuuters and mobile devices. When portability is enabled, the LCC model reduces in size and improves smoothness, making it suitable for most requirements of various scenarios, especially enhancing mobile devices rendering quality. Turning off portability allows for more realistic lighting and shadow effects, but may result in decreased performance or lag.



(2) Map Fusion

Feature introduction

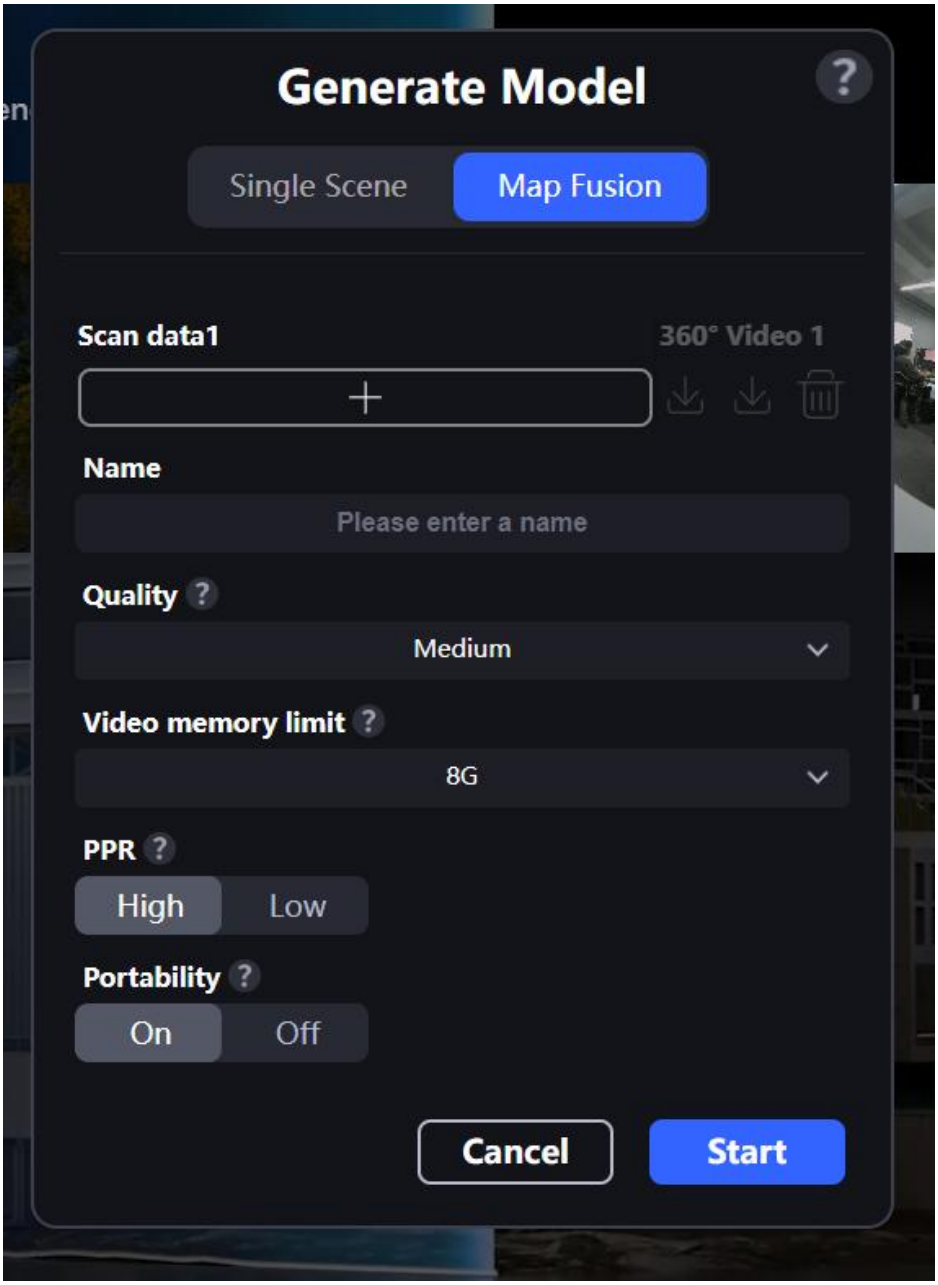
This feature allows users to upload multiple pieces of scanning data at once, preprocess, calibrate, and match the data through highly automated processes, and intelligently stitch it into a complete 3D model.

In LCC Studio, the process of creating a map fusion project is divided into two steps:

Step 1: Batch upload multiple pieces of scanning data and upload panoramic videos.

- **Scanning data:** Users upload multiple data files scanned by the same device in batches, and the interface will display the corresponding device type.
- **360 Videos:** For Lixel L1 and L2 equipped with panoramic cameras, the panoramic video upload option will be activated, and the user needs to upload the video file corresponding to the scanned data; if using the K1 or L2Pro built-in camera to scan, this option will be greyed out, and the user can directly add data in turn.
- **Add other data:** Upload the data that needs to be fused in order according to the process, and up to 10 pieces of data can be fused.

Step 2: Fill in the project name and set parameters (same as the single scene process).



Scanning guidance

When scanning for map fusion, please follow the following guidelines to ensure effective connections and overall accuracy between separate scans.

1. **Scan with RTK or relative control points**

Set relative control points between adjacent scans to ensure the connection between seperate scans. These control points help maintain consistency in later data processing and map fusion.

1. **Ensure using identical device type**

All Lixel scanning device types are supported, but it is important to ensure that the data used comes from the same type of Lixel scanner.

1. **Ensure sufficient overlapping scanning paths**

To improve the accuracy of model fusion, it is recommended to maintain a certain length of overlapping paths between adjacent scans, with a length greater than 15 meters. The overlapping area should be located in areas with rich features, such as those with obvious structures or textures, to improve matching accuracy.

1. **Avoid degraded scenarios**

Avoid overlapping in scenes lacking obvious structural features such as open areas, long corridors, and smooth tunnels, as these scenes may lead to decreased positioning and matching accuracy. Avoid overlapping in areas lacking texture details such as solid colors, darkness, and mirror reflections, as these areas may affect the effectiveness of collection.

1. **Ensure the connection between separate scans**

There must be a connection between all scans, which can be achieved by setting relative control points to ensure the coherence and accuracy of the overall map.（**For more specific details, please refer to the LCC Scanning Guideline**）

Map fusion

LCC Studio 1.6.0 started offering map fusion function. The map fusion function currently supports up to **10 data segments** with a total length of **no more than 200 minutes** .

1. All data fused at once must come from **the same type** of device.
2. Different scans require about 15m of **overlapping area** ; the overlapping area should be avoided to be too small (less than 10m), or the situation where one section of the map completely overlaps with another section of the map.
3. Overlapping areas should be selected as far as possible in the area **with rich features** ; avoid arranging them in low light, stairs, narrow corridors, mirror reflections and other positions.
4. Different map segments currently support **RTK** or **relative control point** stitching. Each map segment must be able to be associated with other maps through **either** . When any map segment has a valid RTK, the stitching result will obtain global coordinates. Here are some examples that **can be stitched** :
   a. 3 segments of data concatenation. Data numbers 1, 2, and 3 all have RTK.
   b. 3 segments of data splicing. 1 and 2 have control points with the same name, while 2 and 3 have control points with the same name.
   c. 3 data splicing. Data 1 has RTK, data 1 and 2 have control points with the same name, and data 2 and 3 have control points with the same name.
   d. 3 segments of data concatenation. Data 1 and 2 have RTK, while data 2 and 3 have control points with the same name.

Key points to note:

To ensure the smooth fusion of multiple scans, there are some special precautions that need to be taken:

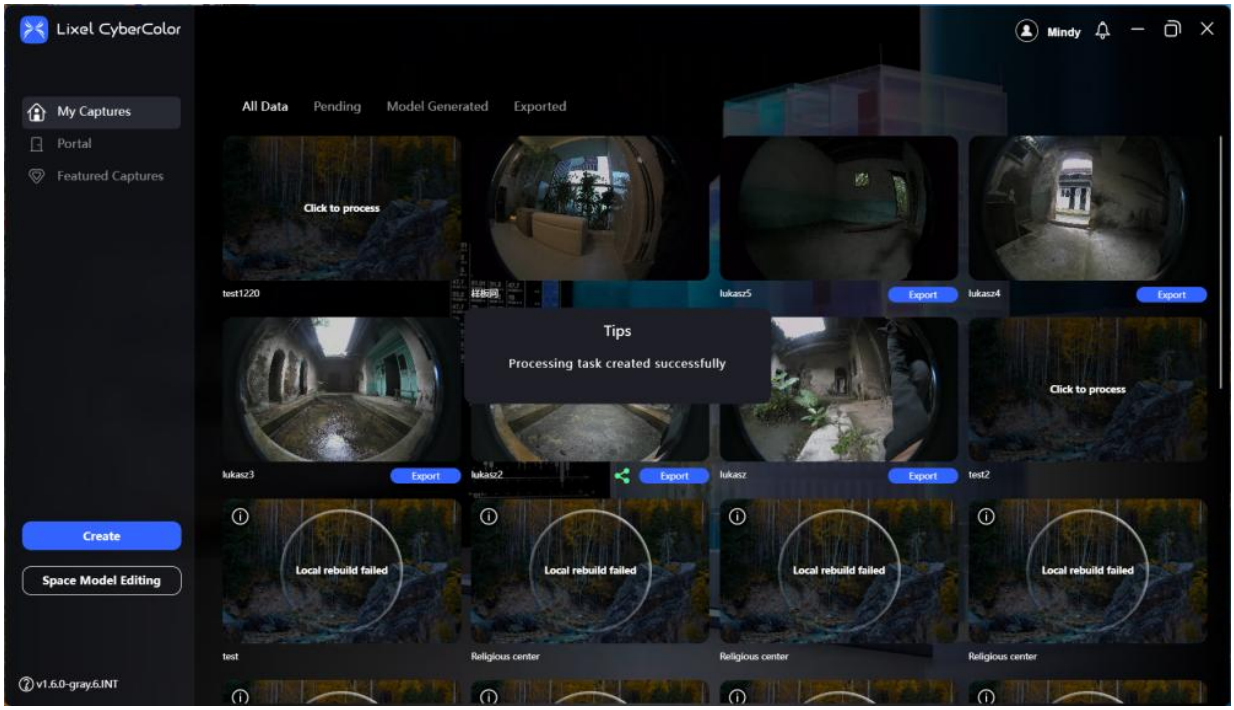
- LCC Studio's Map Fusion feature requires at least 64GB of memory, and devices that do not meet this condition will not be able to use the feature.
- The total number of fused data cannot exceed 10 , and the total scanning time cannot exceed 200 minutes .
- Ensure that the selected data is complete and intact .
- Ensure that the selected data conforms to the fusion rules and comes with a continuous control point file or RTK .
- Ensure that the device type used for all data is consistent with the device type of the first selected project to ensure the consistency of data types .

- Make sure that the disk for the data that needs to be spliced reserves more than 2 times the disk space of the uploaded data itself.

- Ensure that the uploaded panoramic video and captured data files absolutely match .

3. Start processing

After the project creation is completed, click [Start] to load the data. After the data is loaded, it will enter the My Generate List page. In the specific project on the list page, click [Start Reconstruction], and click [OK] in the prompt to start the automatic generative model.



Note:

- When performing batch processing tasks, please ensure that all pending data has been uploaded before queuing for reconstruction. During the processing, to avoid failure, it is recommended not to perform other tasks that may consume video memory on the computer.

- During the reconstruction process, please do not close the LCC Studio software, otherwise the reconstruction task will be interrupted

- When uploading scanning data, please make sure that the disk space under the save directory of lcc data is sufficient. It is recommended that the reserved disk space is at least twice the amount

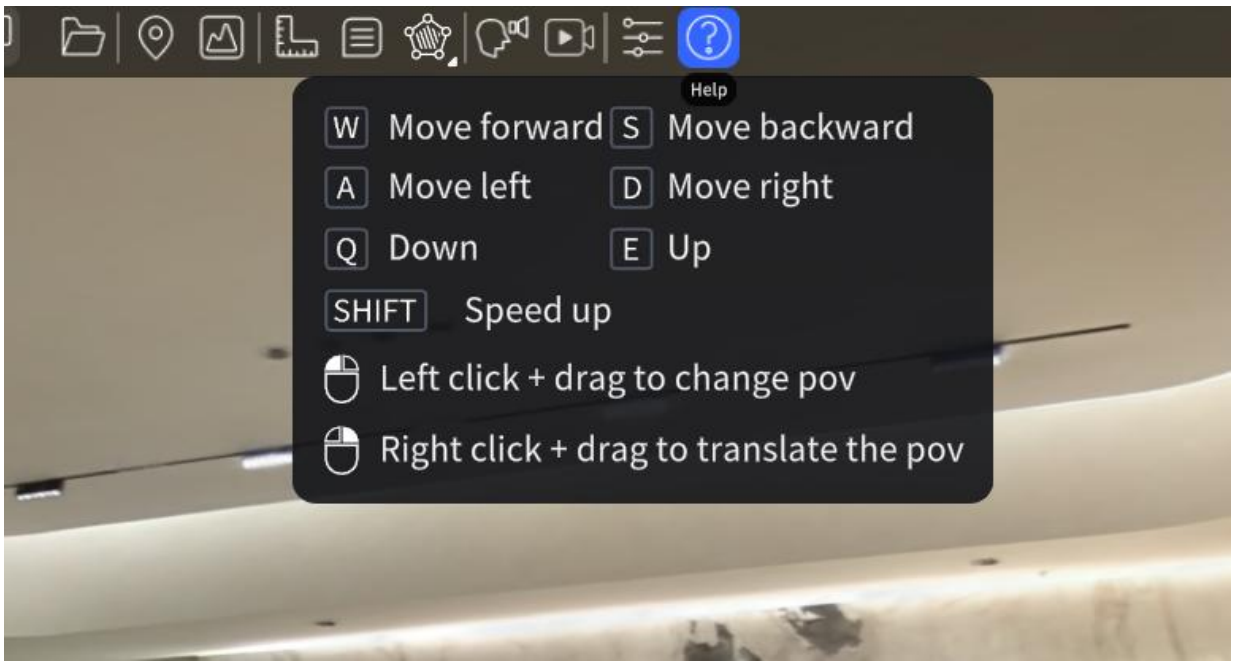
of collected project data . Prevent the reconstruction process from being interrupted or failed due to insufficient space.

- Closing the LCC Studio software during the model generation process will cause the generation to be interrupted. When you open LCC Studio again, the project will display the reconstruction failure and the previous reconstruction progress. Click on the upper right corner of the project, and click on "Continue" or "Restart" to re-enter the queue for model generation.

4. Model Viewing (Viewer in LCC Viewer)

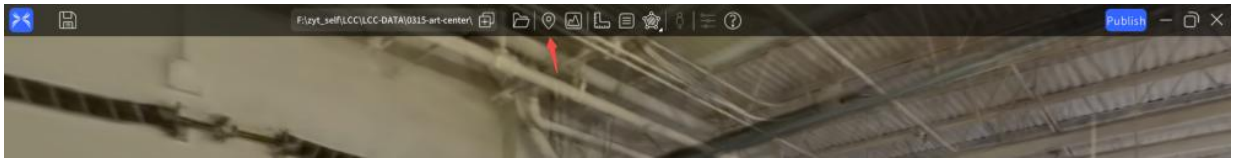
Open the model from the generated data list to roam in the model freely

(1) Help



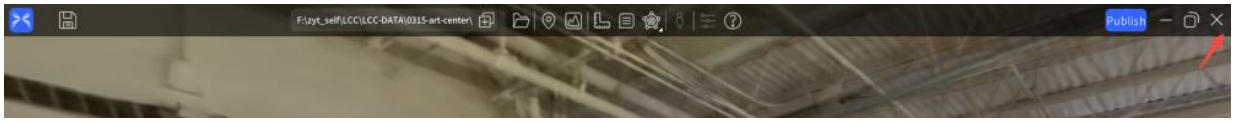
(2) Relocate

Click the "Relocate" button to return to the initial point of the model (the position where the scanner was started during scanning).



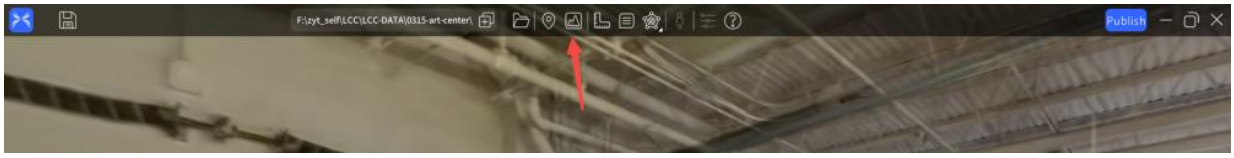
(3) Exit

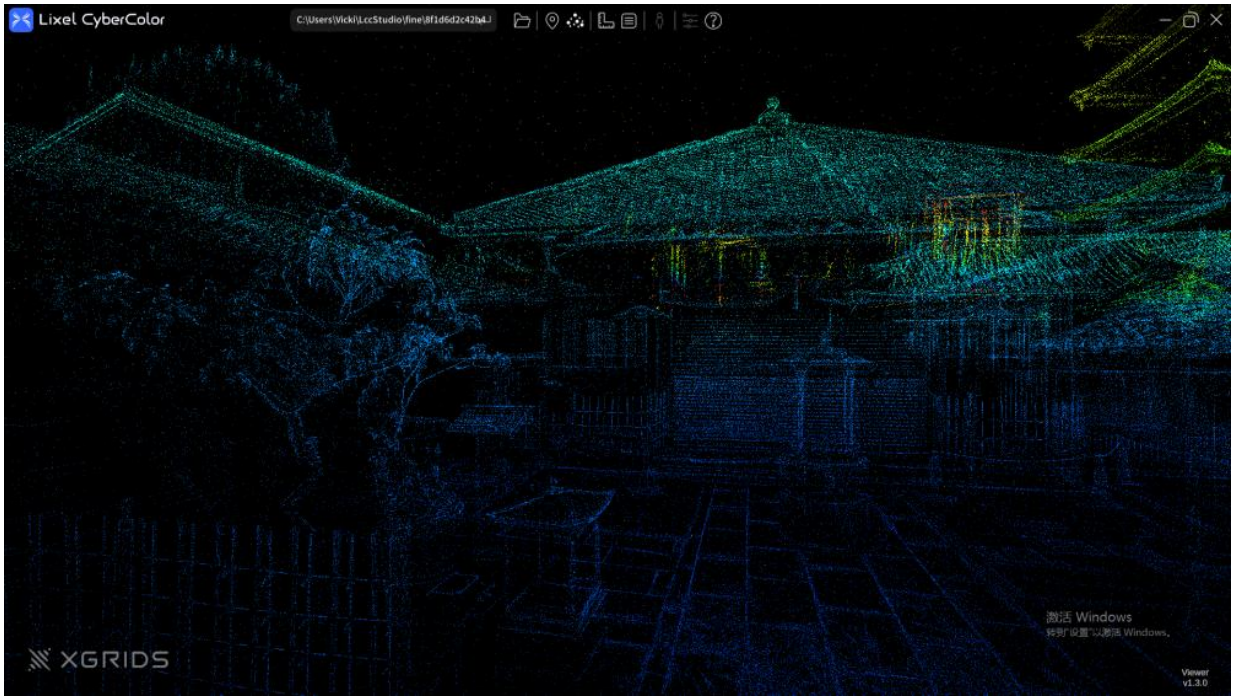
Click the [X] in the upper right corner to close the currently viewed item and viewer.



(4) Switch to point cloud view

Click the "Switch" button to switch to the point cloud view.

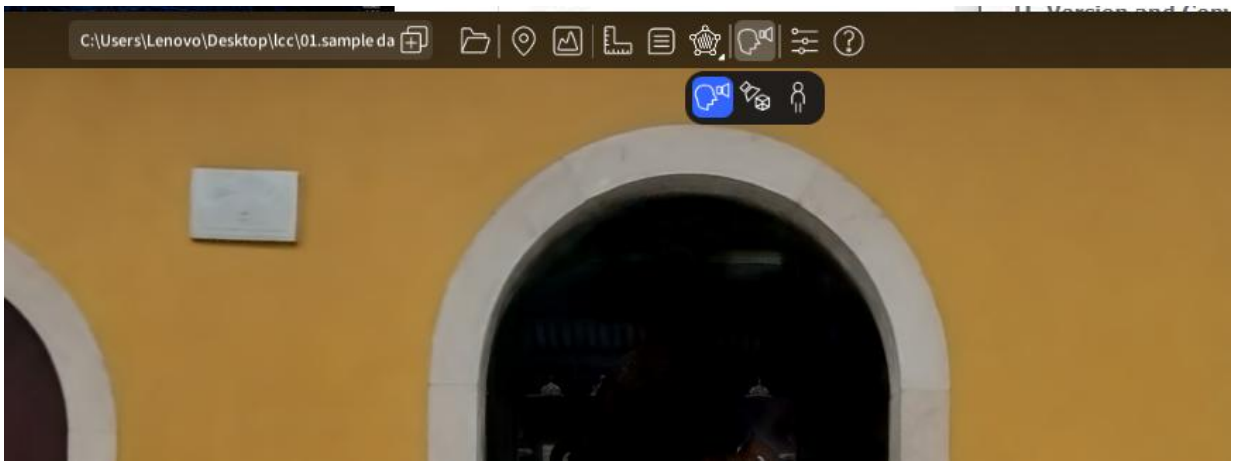

F:\zyt_self\LCC\LCC-DATA\0315-art-center\
Publish


Lixel CyberColor
C:\Users\Vicki\LccStudio\fine\8f1d6d2c42b4...
XGRIDS
激活 Windows
Viewer
v1.3.0

(5) Settings

- **Environment Data**: Toggle sky/external environment display, unaffected by clipping (available in editor and viewer)
- **Collision**: Enable spatial collision detection (on by default). Prompts will appear if collision files are missing.
- **Scanning Path**: View device collection paths (supported across platforms)
- **Measure**: Set units (metric/imperial) with real-time updates, Pro Measurements enable precise readings
- **Rendering**: Switch graphics rendering APIs to resolve display issues (available in the viewer only)

(6) Perspective Tools

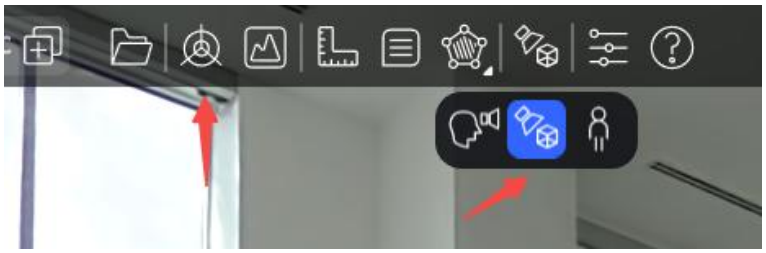


Click on "Perspectives" to choose different viewing modes. There are three viewing tools: [First Person Pespective], [Pivot Mode], and [Avatar].

First Person Perspective：

This usually refers to the space model seen through user's eye in the space. In this perspective, the screen displays the scene seen by the character, with the camera rotating around its center, similar to rotating the observer's head. The WASD keys can be used to move the camera into space.

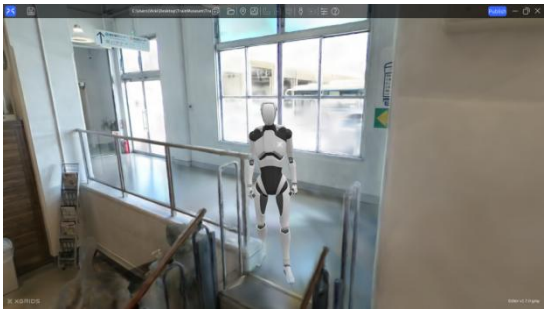
Pivot：

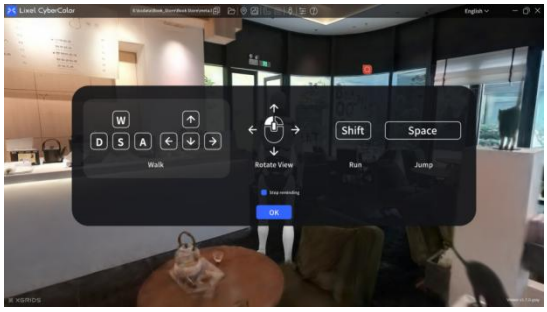


In Pivot Mode, the camera rotates around the pivot point in the scene, suitable for viewing and editing the model globally. Since translating the camera will also move the pivot point synchronously, suddenly switching from "First Person Perspective" to "Pivot Mode" may cause the center point to shift and lead to rotation disorder. Therefore, the "Relocate" function is defined as "Reset Center Point". Clicking it will allow you to quickly re-calibrate the camera position, restore the model's center, and facilitate operation.

Avatar:

This mode, also known as third-person perspective, supports users to turn on a digital character feature in the studio. Clicking it will display operation instructions.





Note: Avatar mode only supports immersive navigation without measurement or editing functions.

(7) View Measurement

Activate Measurement Mode

- Click "Measurement" to start and see operation prompts

Select Measurement Type

- Choose "Distance Measurement" or "Area Measurement"

Distance measurement

- Click "Measure" (magnifying glass appears)
- Select first point on model, this is the starting point
- Select second point, or end point
- A distance will be displayed in meters

Area measurement

- Click "Measure" (magnifying glass appears)
- Select first point
- Select additional points on same plane (minimum 3)
- Click "Finish Measurement"
- System calculates area in square meters

Measurement data management ★

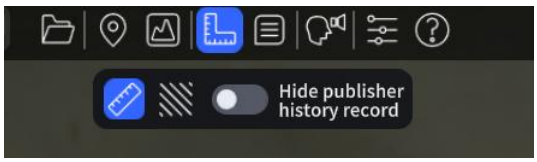
- View: Users can view archived measurement data in the viewer, while also supporting hiding.
- Delete: Delete temporary measurement data in the viewer, but saved data cannot be deleted.

Measurement Unit Settings

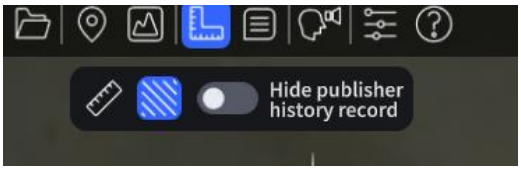
- Switch between metric/imperial systems
- Change units (centimeters, meters, etc.)
- Real-time measurement updates
- Metric is default

Pro Measurements ★

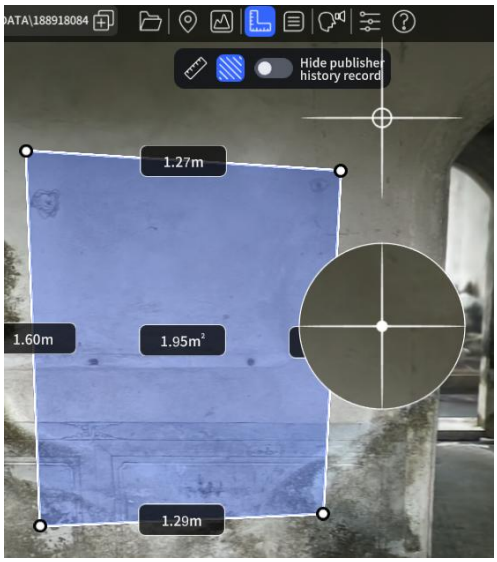
- Shows offset values (dx, dy, dz) between points
- Perfect for verifying horizontal/vertical alignment

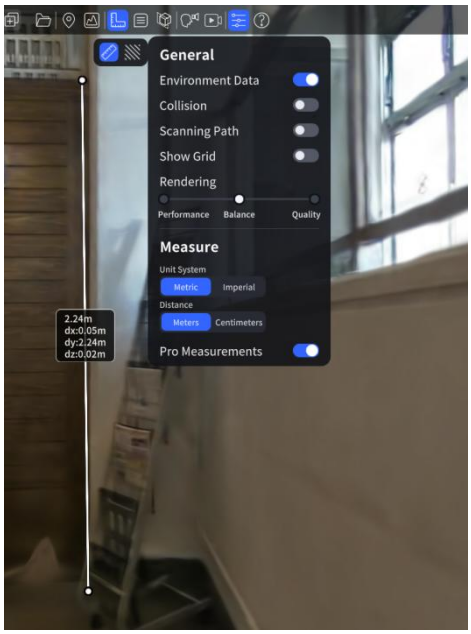


Distance measurement



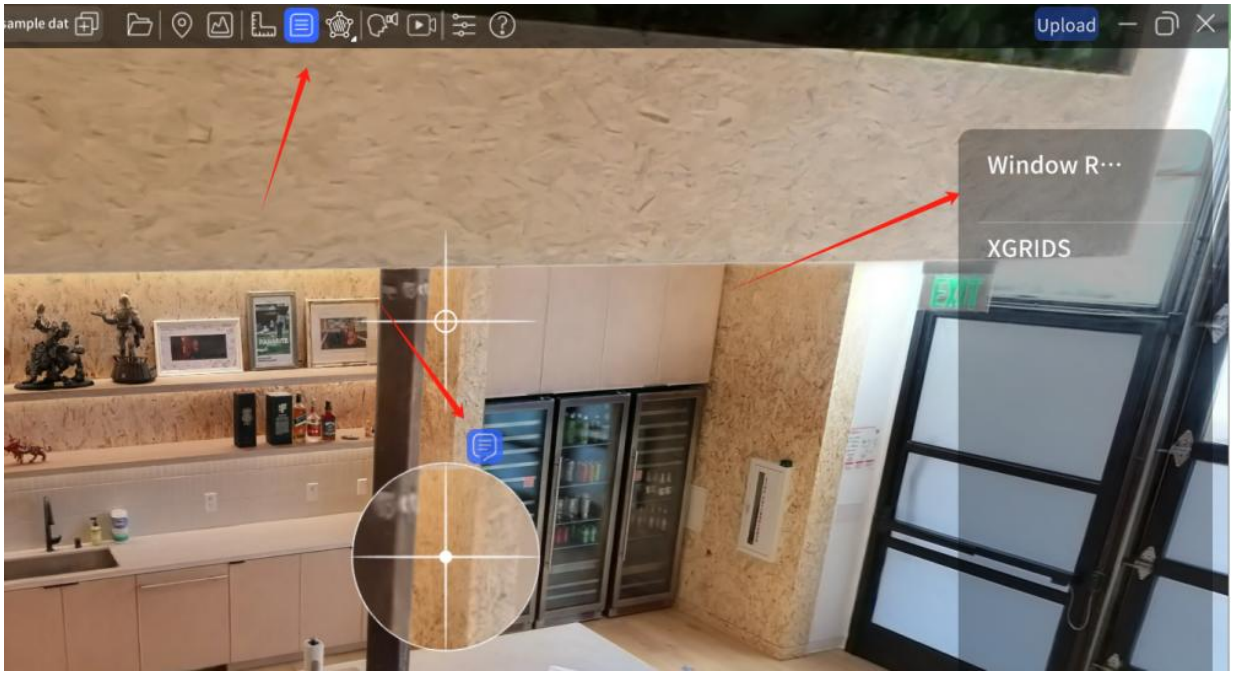
Area measurement





(8) View Notes

The LCC Studio viewer allows users to view rich content in the model, including photos, videos, hyperlinks, images, and text.

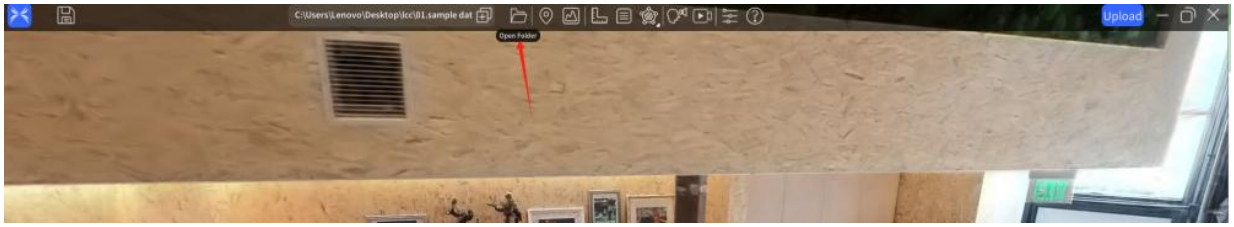


- **Scene enable annotation** : When loading the model, if the model contains notes, the notes function will be automatically enabled and display the annotation.

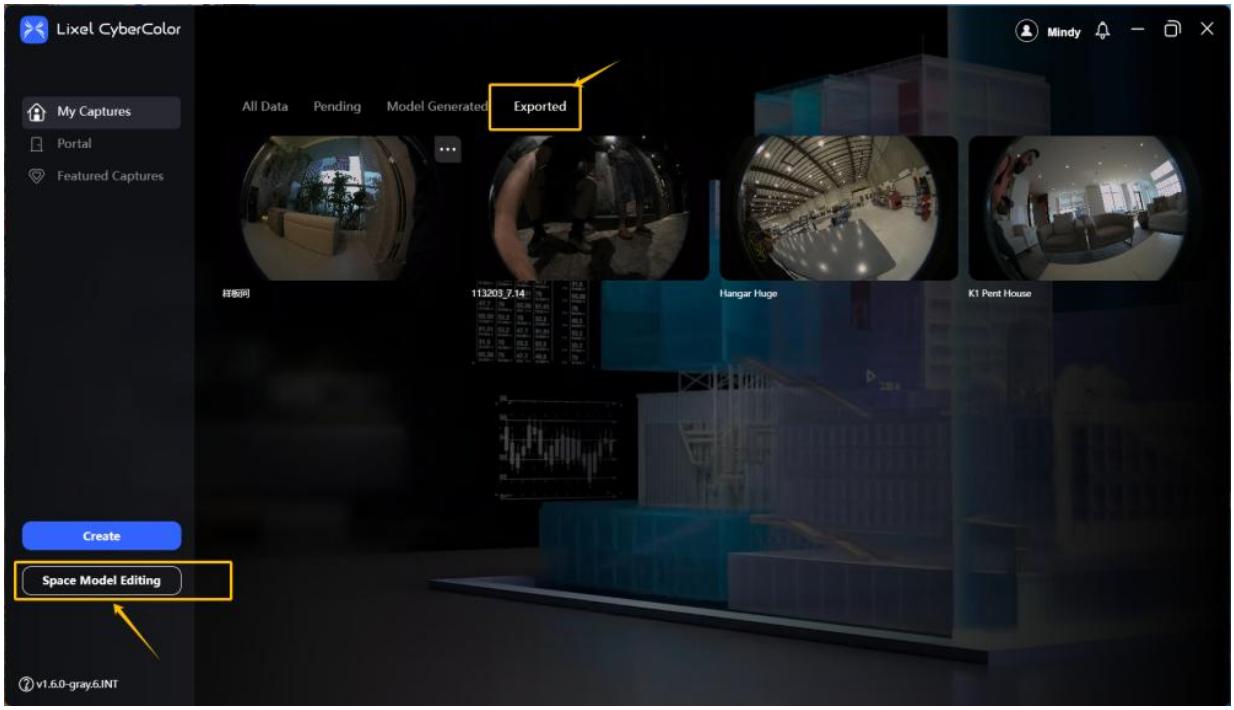
- **Right-hand notes list** : A list will be displayed on the right side of the viewer, containing all nots information in the model.
- **Auto jump** : Click a note in the list, and the scene view will automatically jump to the position of the note.
- **Hover cursor over information** : Hover cursor over an annotation in the scene to display basic information about the annotation.
- **Click to expand Details** : Click the annotation to expand and view the detailed information of the annotation.

(9) View other LCC model

Click "Folder" to select other LCC model files stored locally, or select .ply model files for roaming or viewing.



5. LCC Editor



LCC Scene Editing Rules

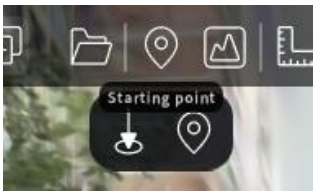
- New version automatically removes 3D watermarks after reconstruction, allowing direct editing
- For view-only access, use menu to enter view mode
- **Editing Exported Scenes**: Edit mode only available for exported models. Export generated models first to enable editing.
- **Unexported Scenes**: View-only access for models not yet exported
- **Local File Editing**: Import and edit local .lcc or .ply Gaussian files

Save Rules

- **Real-time Saving**: All edits (measurements, annotations, etc.) save automatically to project files
- **Clipping Function**: Requires manual "Save As" to prevent overwriting original files

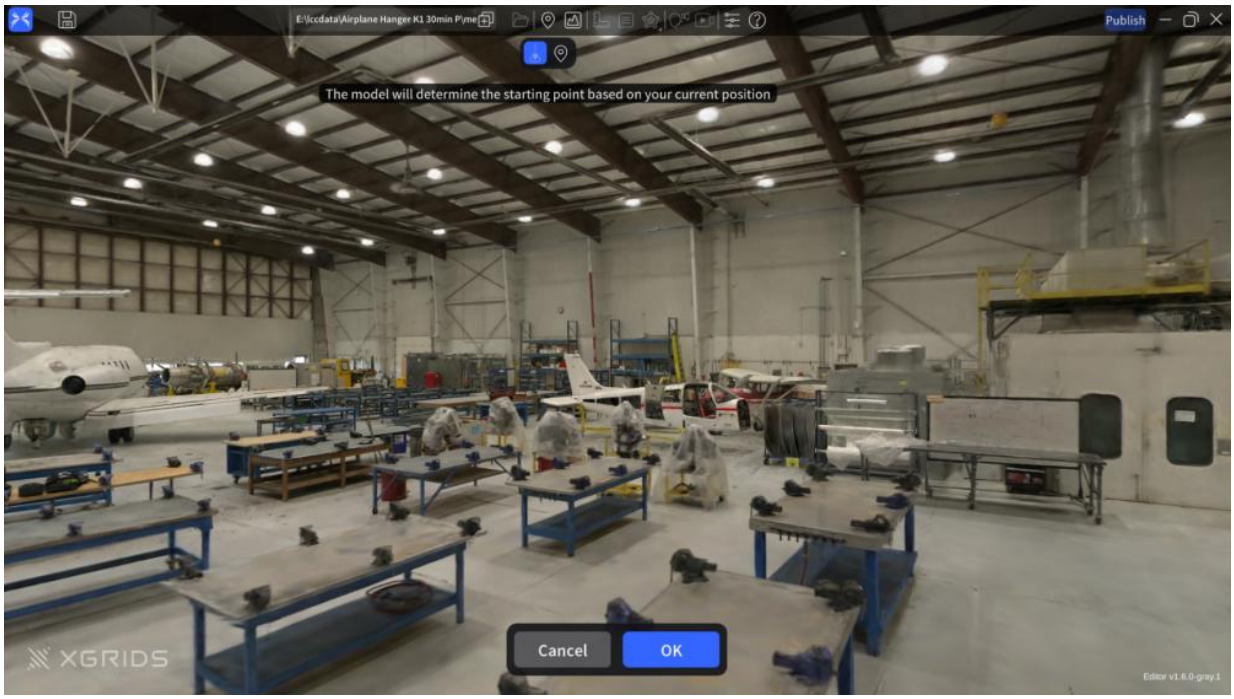
(1) Starting Point setting

The new version update supports users to reset their birth point in the first-person mode, and supports users to return to their birth point and reset their birth point in the birth point function.

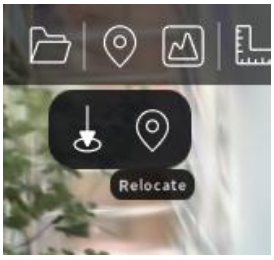


- Reset starting point

When roaming under First Person Perspective, hitting the Reset Start Point button will set the spawn point to where you are currently standing.



- Return to starting point



Hitting this button will take you back to the starting point. If you haven't set your spawn location yet, it will take you to the default spawn location.

After setting the birth point, click "Relocate" to automatically jump to the position set by the birth point. If the user has not set the birth point, it will jump to the initial birth point set by the scene.

Note: If the starting point reset by the user is deleted during the clipping process, the system will issue a prompt after the cropping is completed. The user needs to decide whether to reset the birth point by himself, and the software will not automatically guide or force the user to perform this operation.

(2) Measurement

Activate measurement mode

- Click the "Measurement" button on the interface to activate the measurement function, and the system will display operation prompts.

Select measurement type

- Select "Distance Measurement" or "Area Measurement" as needed.

Distance measurement

- **Activate measurement function** : After clicking the "Measure" button, the system displays the magnifying glass icon, indicating that the measurement function has been activated.
- **Select starting point** : Select the first measurement point in the scene.
- **Select end point** : then select the second measurement point.
- **Record and display results** : After clicking on the second point, the system automatically calculates the distance between the two points and displays the results in meters.

Area measurement

- **Activate measurement function** : After clicking the "Measure" button, the system displays the magnifying glass icon, indicating that the measurement function has been activated.
- **Select starting point** : Select the first measurement point in the scene.

- **Define the measurement area** : Continue to select additional points on the same plane, at least three points are needed to define an area.
- **Complete Measurement** : After selecting all points, click Finish Measurement.
- **Record and display results** : The system automatically calculates the area within the selected area and displays the results in square meters.

Measurement data management★

- View: Users can view archived measurement data in the viewer, while also supporting hiding.
- Delete: Delete temporary measurement data in the viewer, but saved data cannot be deleted.

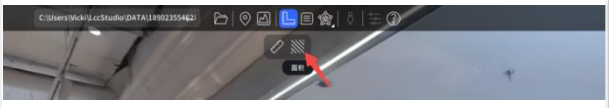
Measurement Unit Settings

- Switch between metric/imperial systems
- Change units (centimeters, meters, etc.)
- Real-time measurement updates
- Metric is default

Pro Measurements ★

- Shows offset values (dx, dy, dz) between points
- Perfect for verifying horizontal/vertical alignment

Distance measurement



Area measurement

(3) Notes

LCC Studio editor provides a powerful annotation tool that allows users to add rich annotation content to scene models, including photos, videos, hyperlinks, images, and text.

Add notes

- Users can add notes anywhere in the model.

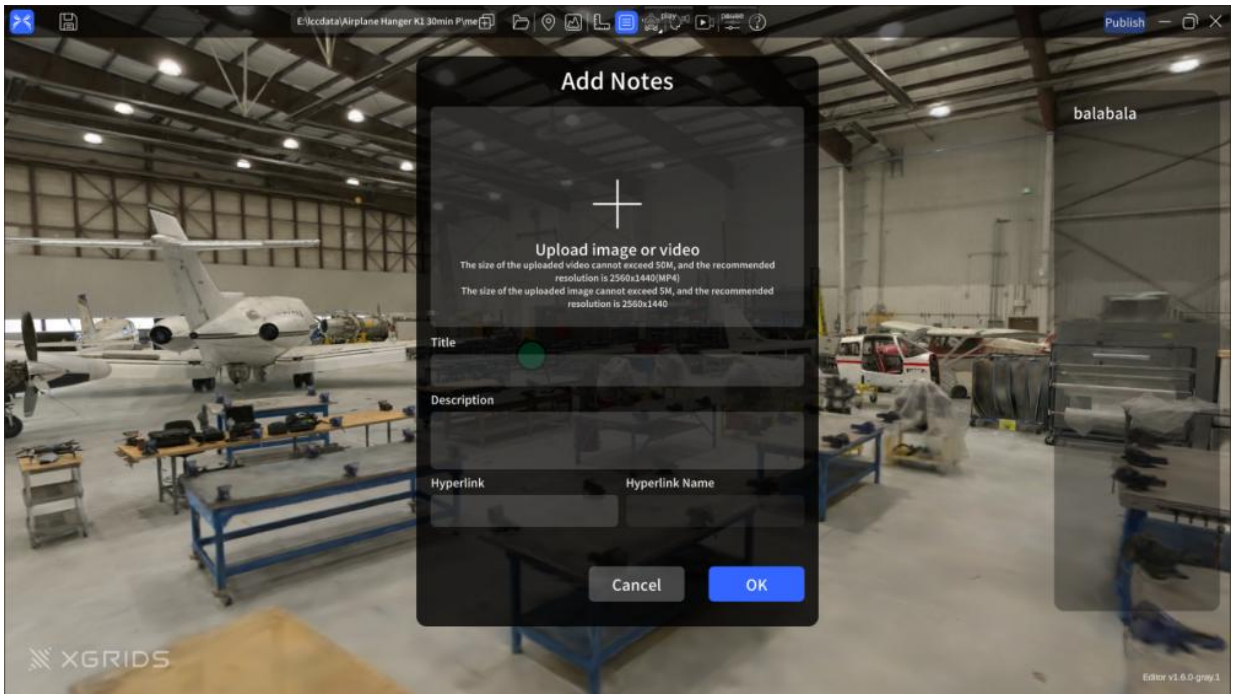
Modify annotation content

- Click the notes in the list or in the models to edit and modify the notes information.

Notes management

- List display: The user's annotated content will be displayed in real time in the list or model on the right.

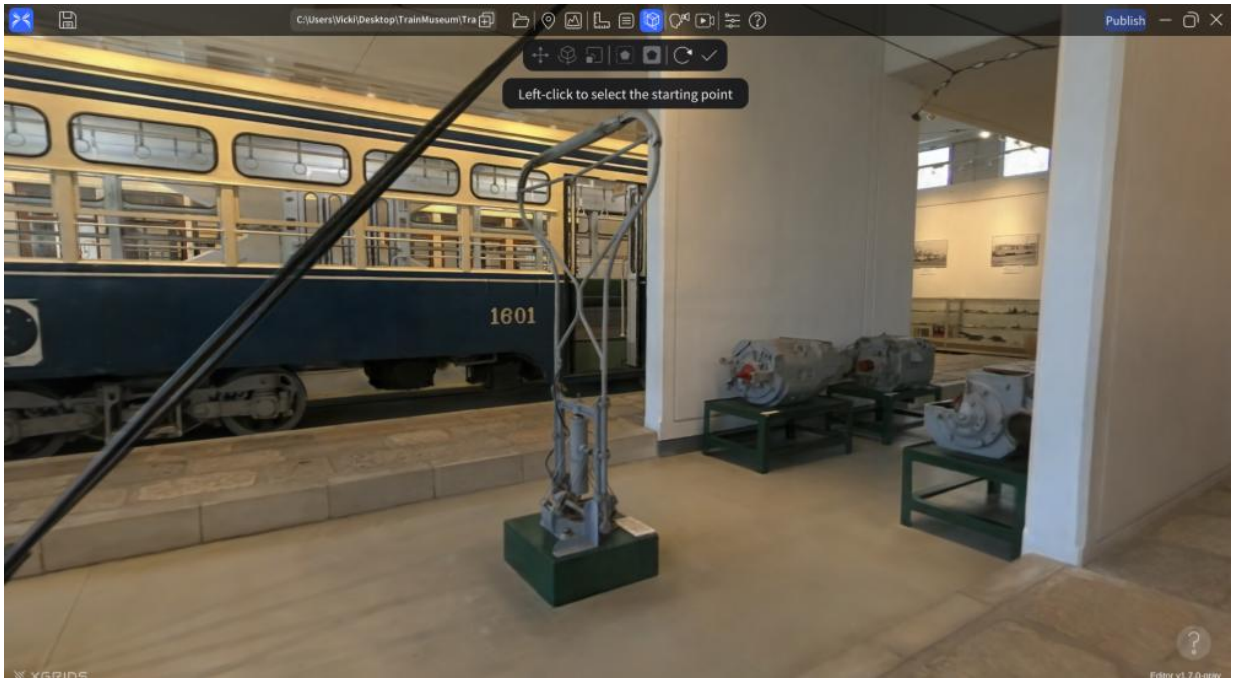
- Delete: Allows users to delete notes that are no longer needed in the list.



(4) Clipping★

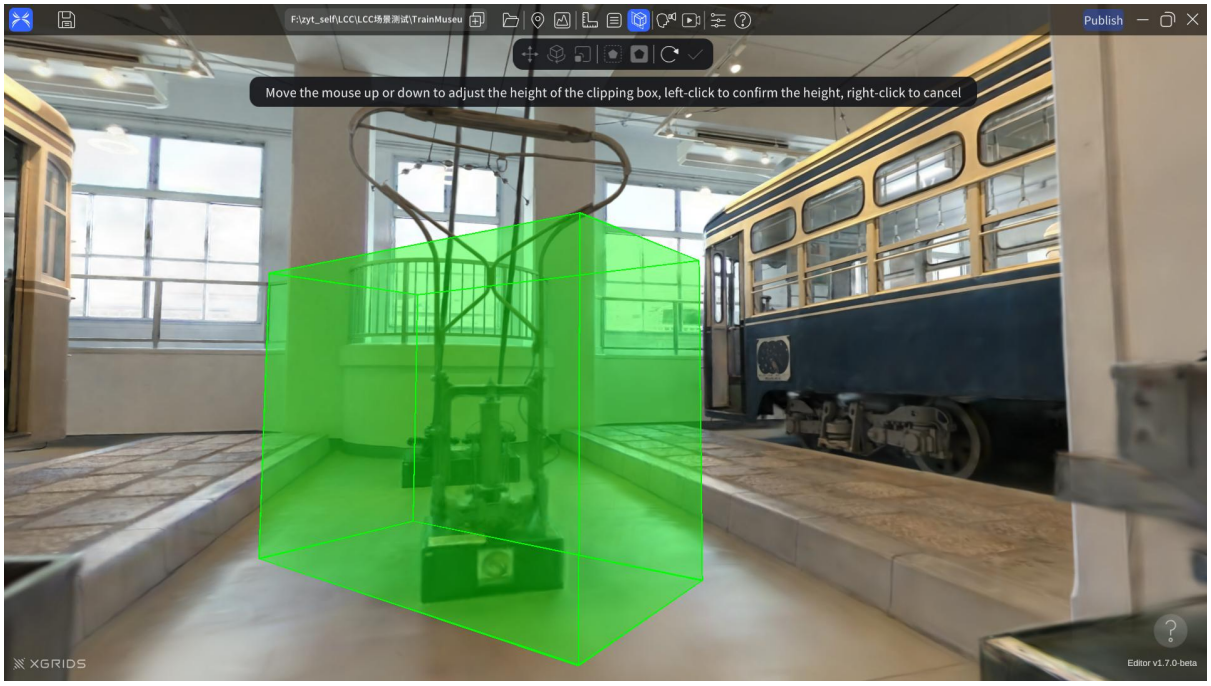
The update includes improvements to the clipping feature. Now, users can customize the clipping area and adjust the position of the clipping box by dragging. Additionally, it supports both outer and inner clipping operations, as well as rotating the clipping box around the Y-axis.

- **Clipping according to the top prompt:** To clip around the object, left-click with the mouse to select the starting point.

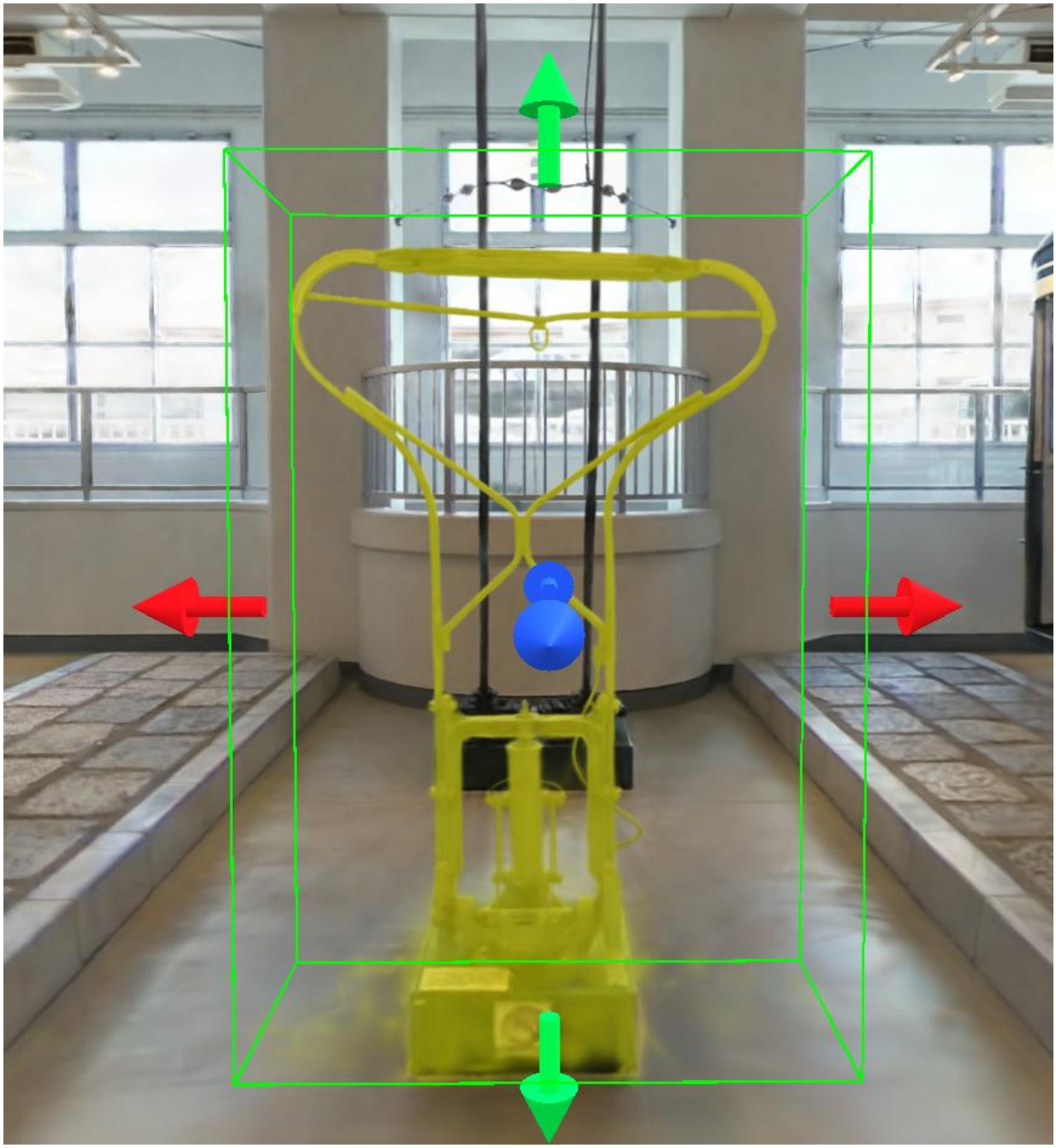


Move the mouse to confirm the clipping area, click the left mouse button again to confirm, and right-click to cancel the operation.

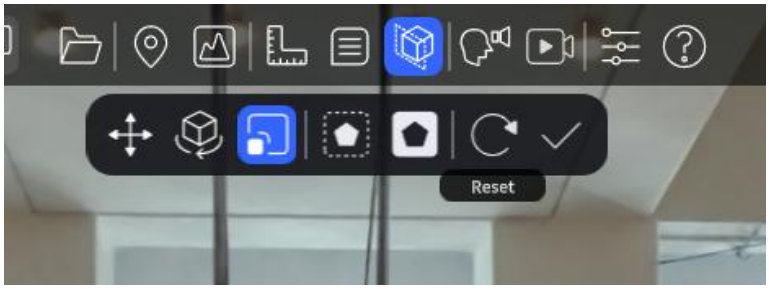
Pull up to confirm the height of the clipping box, left-click to confirm the height, right-click to cancel.



From this point, the size and location of the clipping box is confirmed.



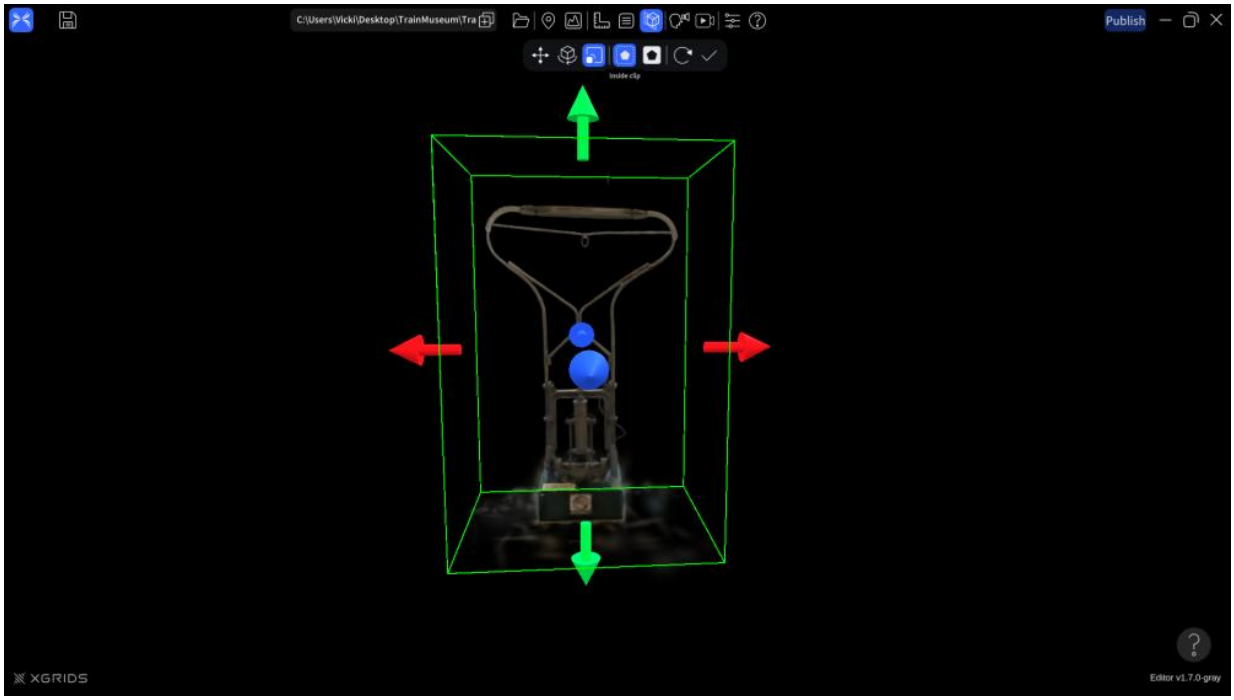
The reset button will undo all current user operations and start drawing the clipping box again.



From then on, the clipping box range confirmation is completed, and the part surrounded by the crop box will be **highlighted in yellow** .

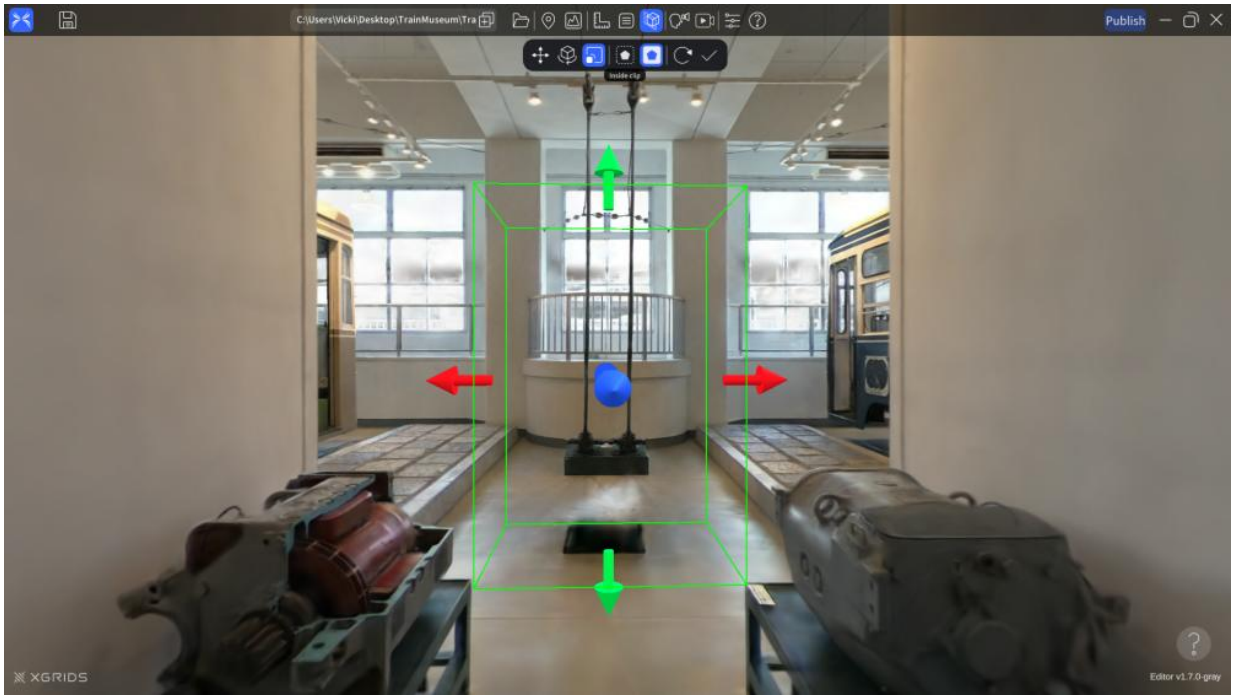
- Interior clipping

The current cropped part is the display part.

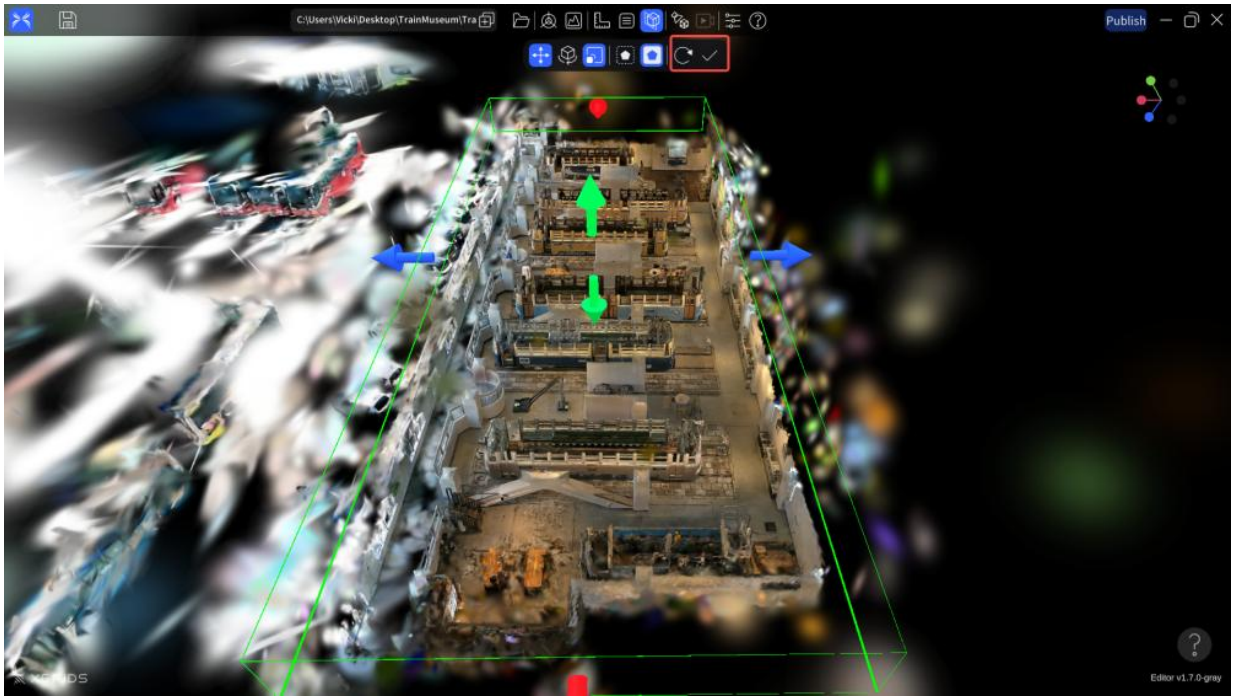


- External clipping

The currently clipped part is the hidden part.

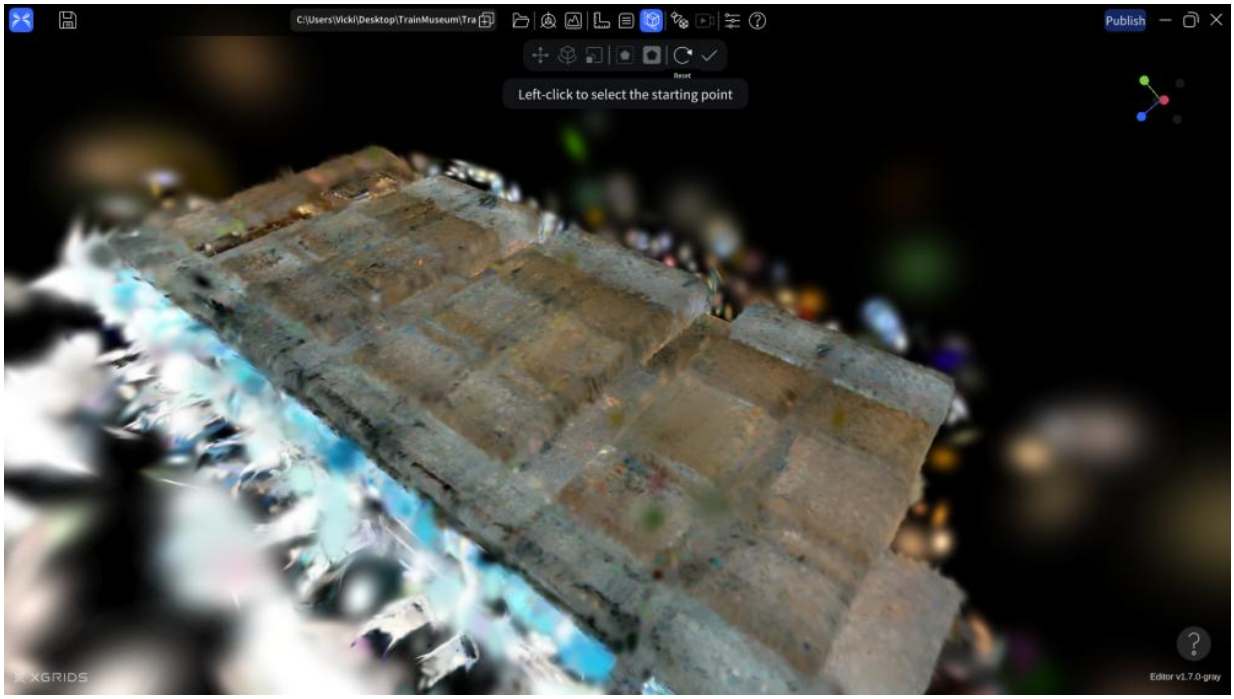


- Apply and reset



Reset

Undo all current user actions and restart drawing the clipping box.



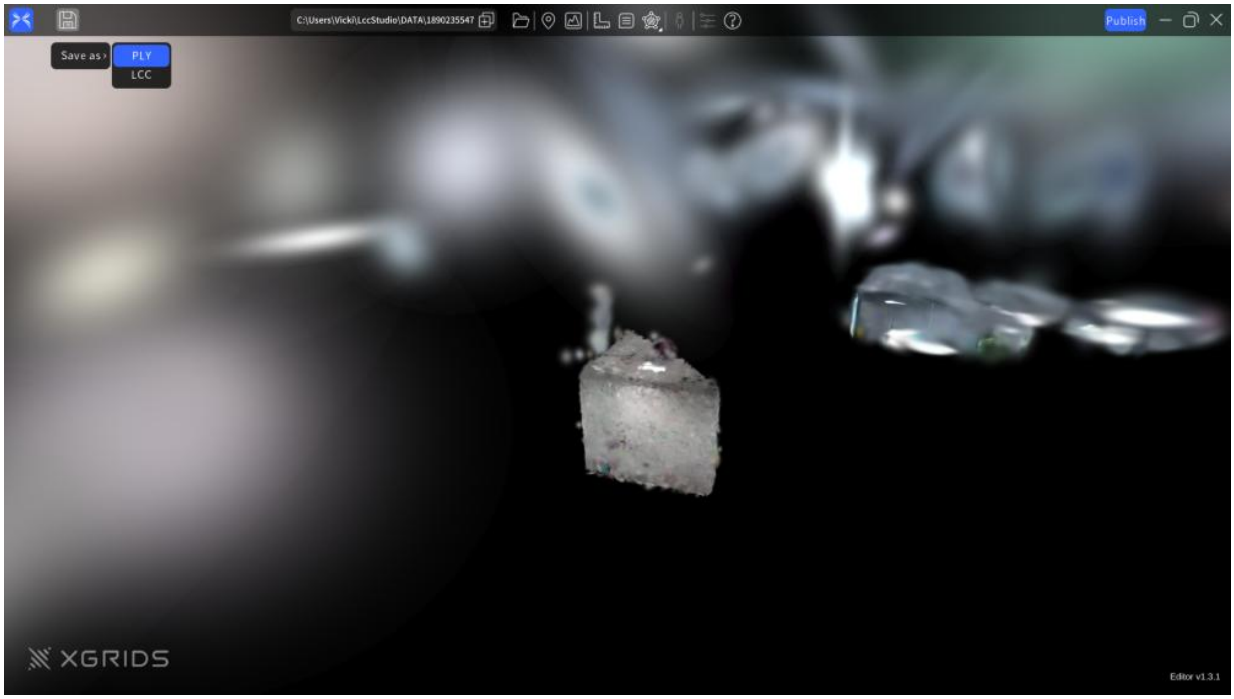
After entering clipping mode, the "?" in the bottom right corner of the window provides a shortcut key guide for the clipping function. **Ctrl + Z:** Helps the user undo the last operation.

Apply

When you click [✔], the latest clipping state is applied, the clipping box will disappear, and the clipping function will be exited.

Save as

When the model content is successfully cropped, click the "File" icon in the upper left corner, select "Save As", that is, you can re-store a cropped model, supporting storage as **.ply.** and **.lcc** format files.



Note: Exit the current model editing. If you do not save the cropped model, it will be remembered twice

- **Six-view display**

In clipping mode, when the perspective switches to pivot mode, the "six-view function" will be activated in the upper right corner, making it easy for users to view from different orthogonal perspectives.

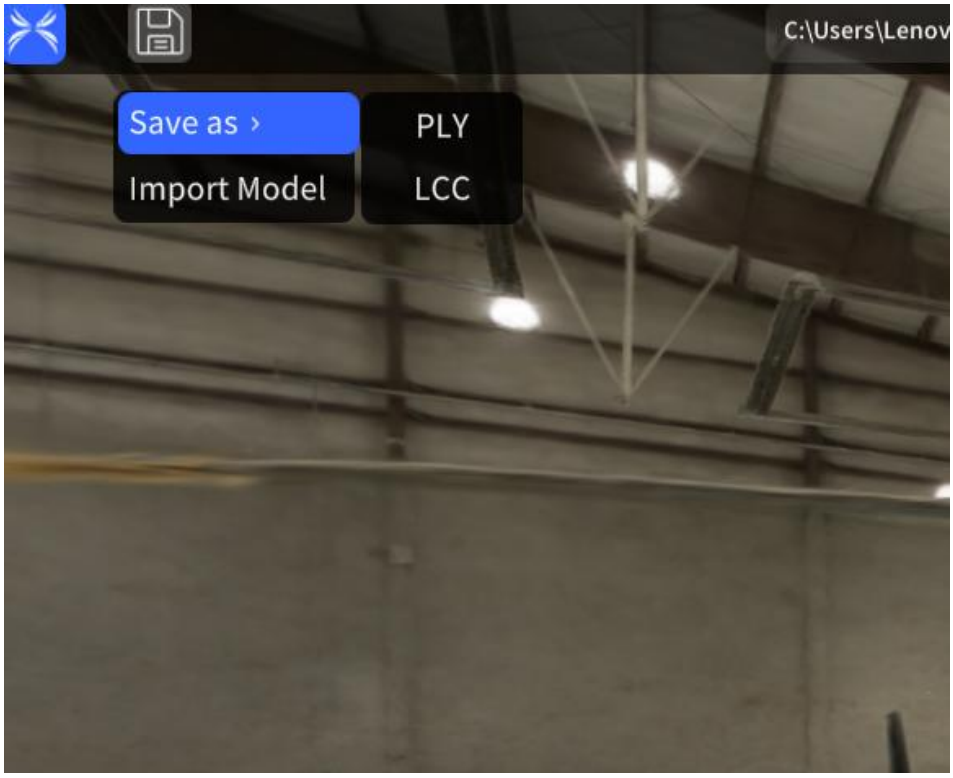
- How to operate the cropping function?

After entering the cropping mode, the shortcut operation guide for the cropping function is in the lower right corner of the window.

Ctrl + z: Help the user undo to return to the previous operation

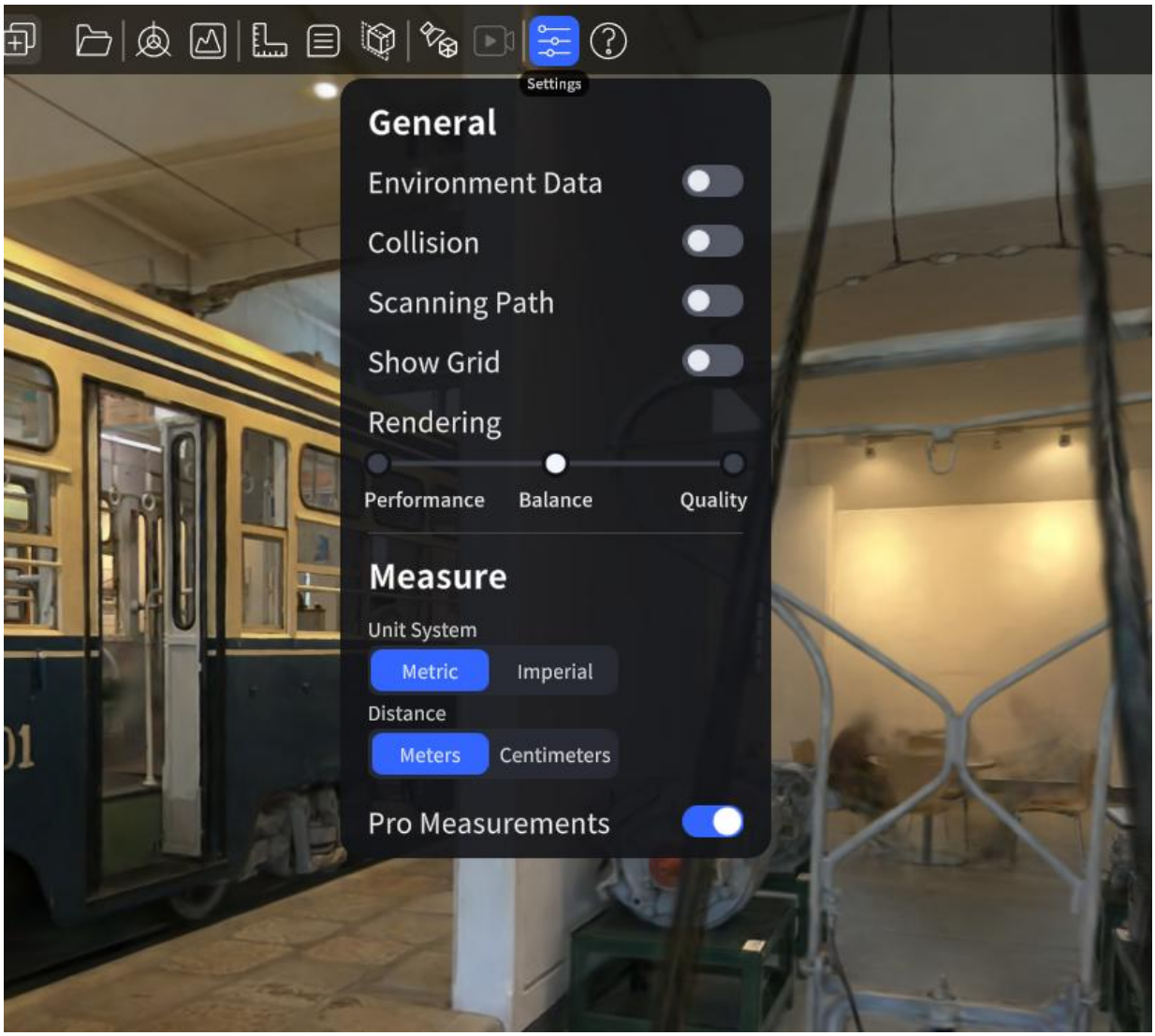
(5) Save as

The LCC Studio editor allows users to save the current LCC scene file as a new file, supporting two file formats: .LCC and .PLY. This feature is mainly used for cropping operations, so that users can save new cropping records for secondary editing or backup.



Note: When the user chooses to save the file as .LCC format, the software will automatically close the current scene and open the newly saved scene, while saving as .PLY format will save the file as a separate file without involving automatic scene switching.

(6) Settings



- **Environment Data:** Click on Environment Data to toggle the display of environmental data. The current model's environment data (sky/external environment) is not affected by model clipping, and models with environmental data can be freely toggled on or off in both the editor and viewer.

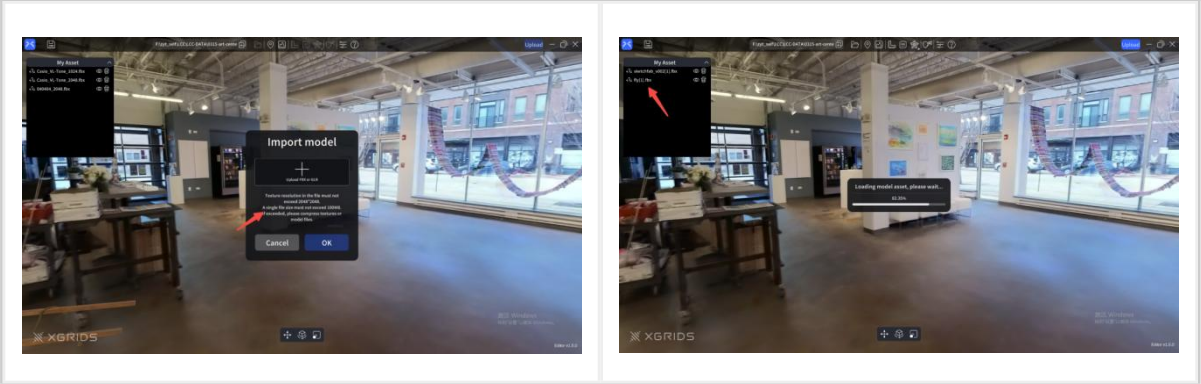
- **Collision**: The new version of LCC Studio allows users to enable the spatial collision feature, which is activated by default when opening a scene. If collision files are missing, the system will prompt the user.

- **Scanning path**: The latest version of generated LCC scenes supports viewing the device's collection path. This feature is supported across all platforms.

- **Measure**: Set units (metric/imperial) with real-time updates, Pro Measurements enable precise readings

(7) 3D Assets Overlay

This function is located in the upper left corner of the software interface. Users can import 3D model assets by selecting "Import Model".



- **Supported file formats** : The latest version of LCC Studio supports importing .fbx, .glb and .obj format model files.
- **The texture shows** :
    - If the model file contains texture information, the texture effect will be displayed after import.
    - If the model file does not contain texture information, the texture effect will not be displayed.
- **Model operation** :
    - Click on a model in the model list, and the model will be displayed as selected and supports translation, rotation, and scaling operations.
    - Double-clicking a model in the list can quickly locate the model's location and zoom in to display the model.
- **Display and Delete** :
    - Support displaying, hiding, and deleting models.

Notes and limitations :

1. **Import time** : The time to import a model may vary depending on the size of the model file and the performance of your computer's hardware.

2. **File size limit** :

    a. A single import file does not exceed 100MB .

    b. Support importing multiple files, but the total file size does not exceed 1GB .

3. **Texture resolution limit** : The texture resolution of a single file cannot exceed 2048 * 2048 .

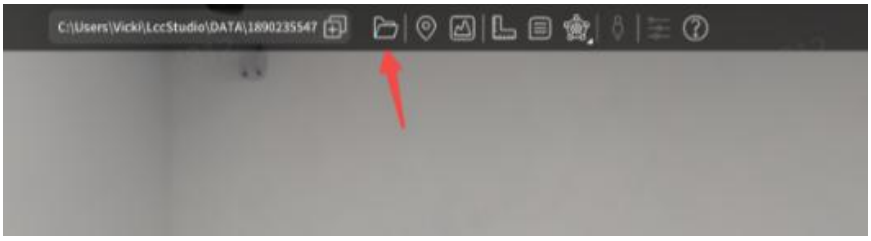
4. **Default length unit** : The default length unit used by imported models is meters.

5. **Fluency limits** : The size of the model can affect the fluency of operations when working with jump spaces that contain model assets.

6. **Supported texture formats** : Currently importing models with textures only supports .jpg and .png formats.

(8) Load Other Models

Click the **[Folder]** icon to select other locally stored LCC model files, or choose a .ply model file for editing.



Users can import .ply (3DGS) files into LCC Studio or the local LCC Viewer for operations. After importing the PLY file, model operation tools (Translate, Rotate, Reset, Save) will appear at the bottom of the interface. Repeated clicks on a function will exit the corresponding operation mode.

- **Translate**: This function allows you to move the model and change its orientation.

- **Rotate**: This function supports rotating the model and adjusting its angle.

- **Reset**: This function reverts all changes made to the model, returning it to its default initial state.

- **Save**: This function lets you save a specific view setting, which will automatically be applied the next time you access the model.

Note

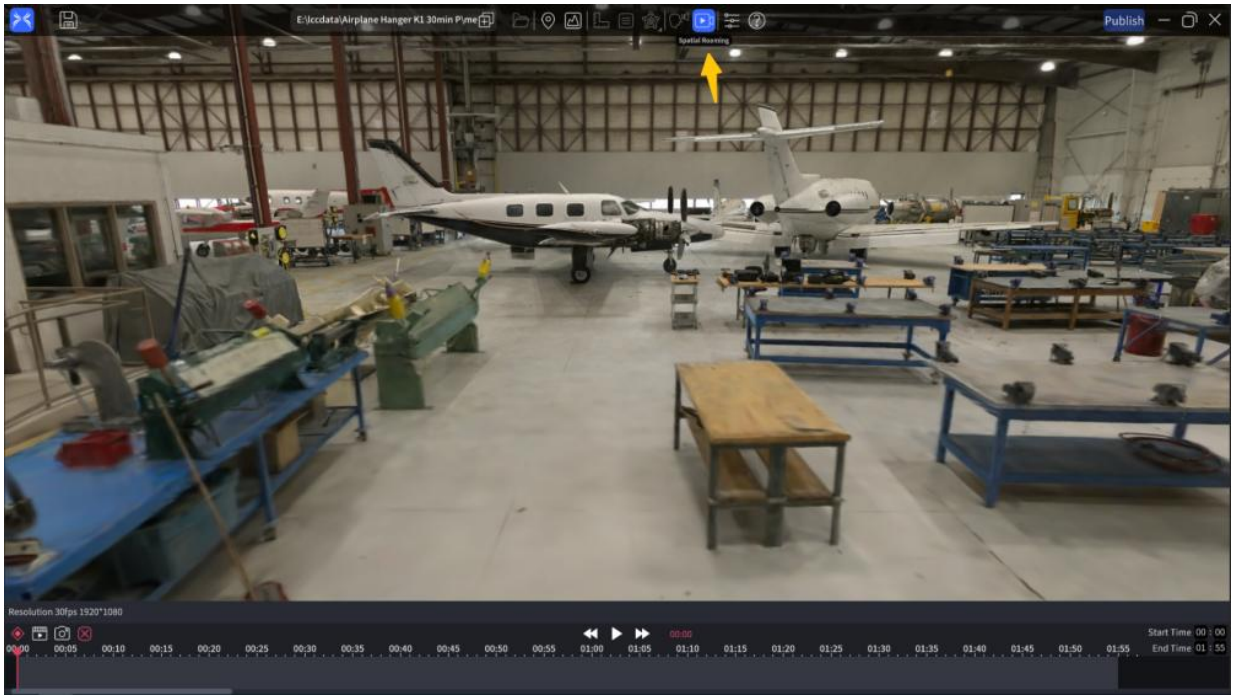
- **For .ply (3DGS) files generated by LCC Studio, the software will automatically recognize them as LCC format, and all viewing and editing operations will be consistent with LCC format files.** However, for .ply files from third-party software or sources, the Studio and Viewer will perform some special processing, particularly the position of the starting point, which may be altered. This change generally will not affect the file's usage.

- To ensure compatibility of older versions of .ply (3DGS) files with the latest version of the LCC software, it is recommended to convert these files using the latest version of the software for proper functionality.

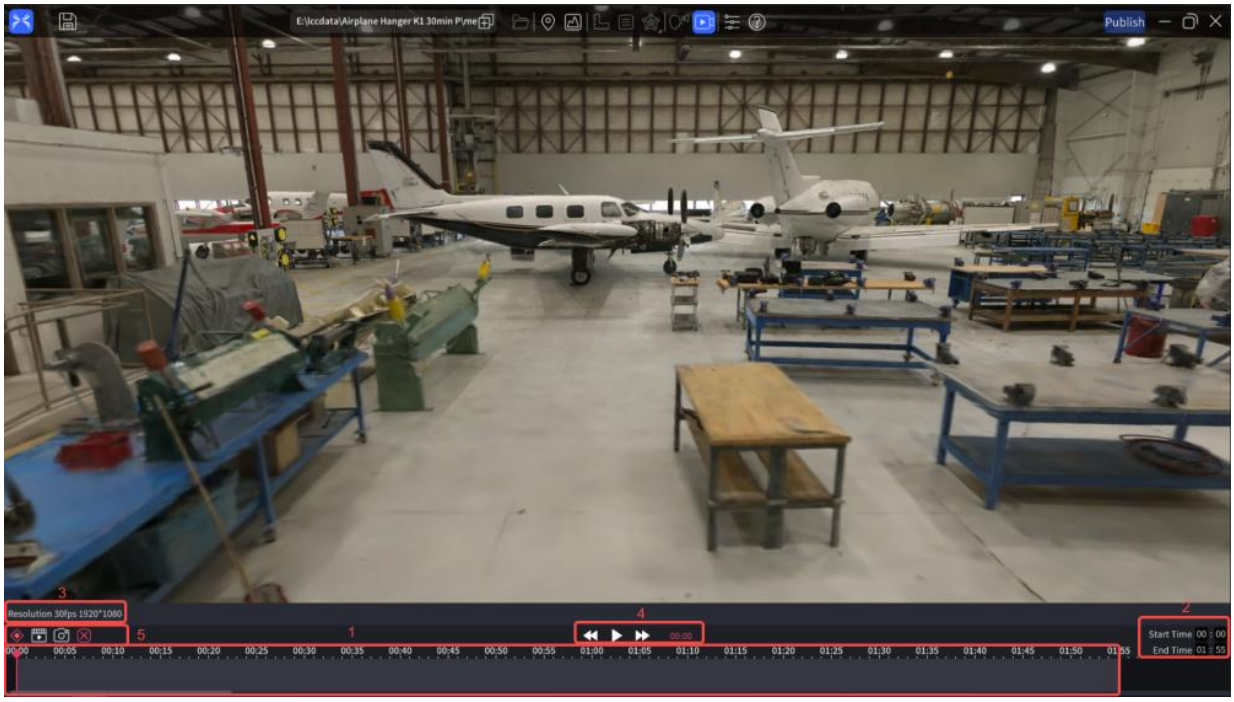
- When importing .ply (3DGS) files, the system will automatically convert them to LCC files for operation, but this may have some impact on model rendering performance and quality.

(9) Spatial Fly-through

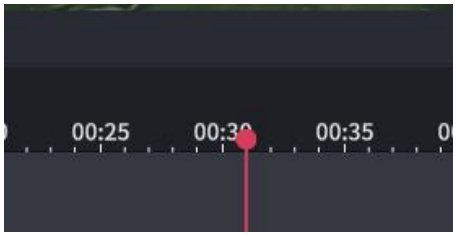
The latest version supports camera roaming and video recording, available through the "Spatial Roaming" option in the top menu of the software interface.



Upon entering camera recording mode, a timeline panel will appear at the bottom of the software. Users can record in **First-Person** mode.



- **Timeline**: Used to jump to different frames, operate keyframes, and control video animation playback.
- **Playhead**: The red vertical line shows the current time point and can be dragged along the timeline to quickly locate the view of a selected keyframe.



- **Time Range**: Determines the length of the recorded video. By default, it is set from 0 seconds to 1 minute 55 seconds. You can adjust this setting using the start time/end time inputs in the timeline.
- **Output Parameters**: The default output video parameters are set to 1 second/30 frames with a resolution of 1920x1080.
- **Playback Controls**: These buttons control the playback and display the current playback progress.

- **Functional Operations**:

1. **Add Keyframe**: Click this function to record the current camera position and viewpoint on the timeline.

2. **Video Output**: Once you confirm the animation output range (from start time to end time), click **Video Output** to choose the output path through the file manager, and the video will be saved directly in **.MP4** format.

3. **Screenshot**: During the roaming process, you can capture the current camera viewpoint as an image and save it to the output file path at any time.

4. **Delete Keyframe**: Deletes the selected keyframe.

Special Notes (Limitations):

- **Time Range Limit**: Limited to the set time range, with no playback or rendering allowed outside this range.

- **Follow Current Frame**: Automatically pans the view to keep up when the playhead moves out of the visible area.

- **Unified Video Output Format**: Does not support output format selection; video export is fixed to **.mp4** format with a resolution of 1920x1080.

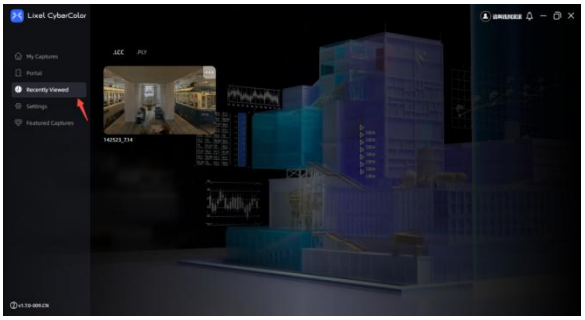
- **Auto Save**: Roaming recording operations are saved in real-time within the project file.

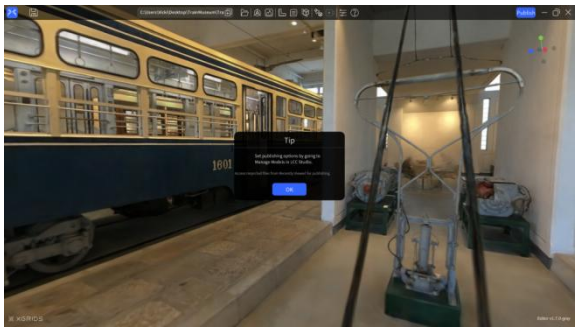
(10) Publish Model

- Publishing now managed entirely within Studio

- Editor no longer supports publishing operations

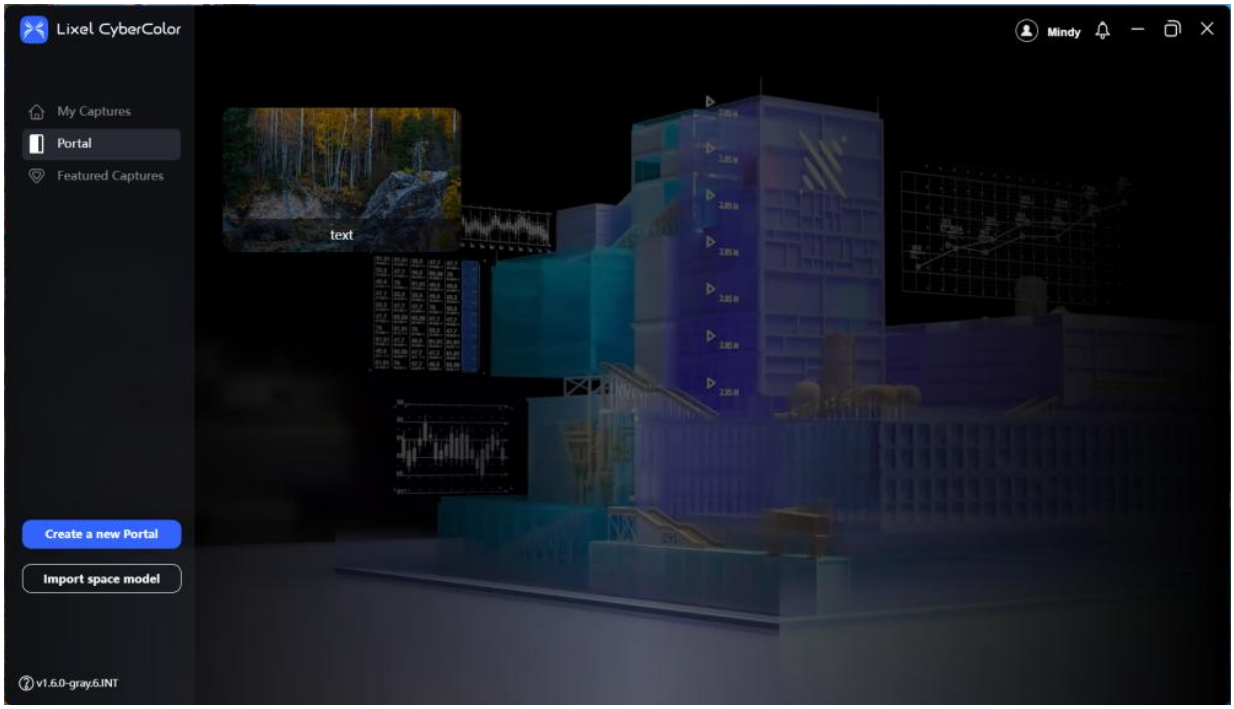
- To publish imported external files, locate them in Studio's "Recently Viewed" list





6. Portal

In the "Portal" list, select "Creat a new Portal" to create portals for multiple LCC model transitions.

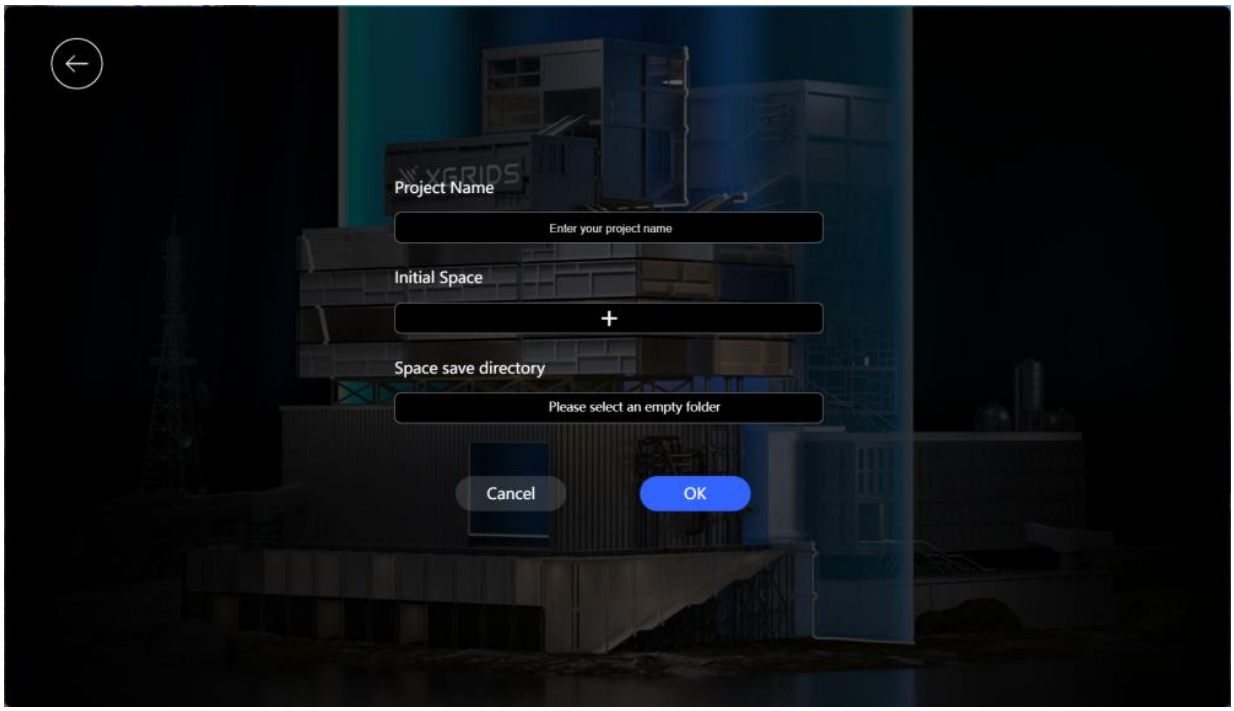


Note: Currently, you can add 10 LCC scene models at most to establish portal relationships.

(1) Create a portal project

- Click the "Creat a new Portal" button in the "Portal" list to create a portal project.
- Project name: Enter the name of the portal porject.
- Initial space: Configure the initial model of portal.

- Project save directory: Select the storage location for configuring portal files.



(2) Upload the initial model

- In the Upload Data option, that pops up, select and upload the file for the initial model.
- The system will automatically generate a thumbnail for the space model for preview.

Click OK to start configuring the multi-model space in the editor.

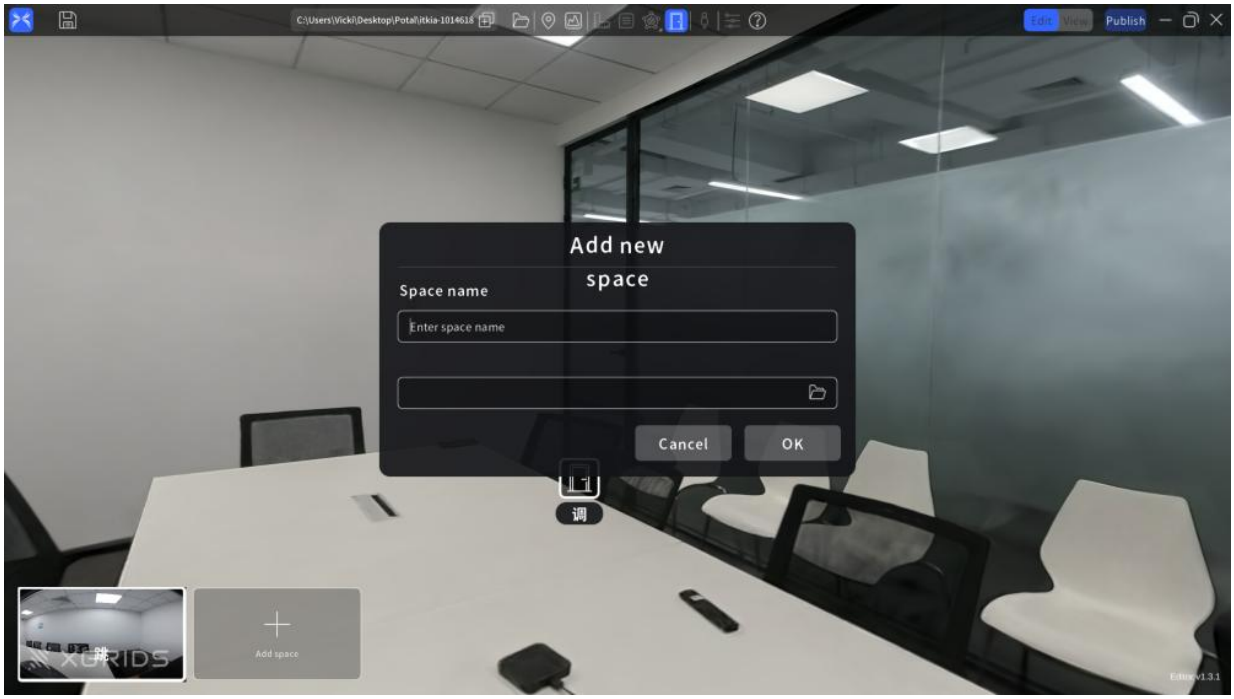
Note : Confirm that the first scene model uploaded will be the default starting point scene.

The thumbnail of the initial space and the new space model defaults to using the image in the project folder; if there is no image, the system automatically captures the scene image; if it still cannot be obtained, the model list will be displayed blank.

(3) Add a new portal

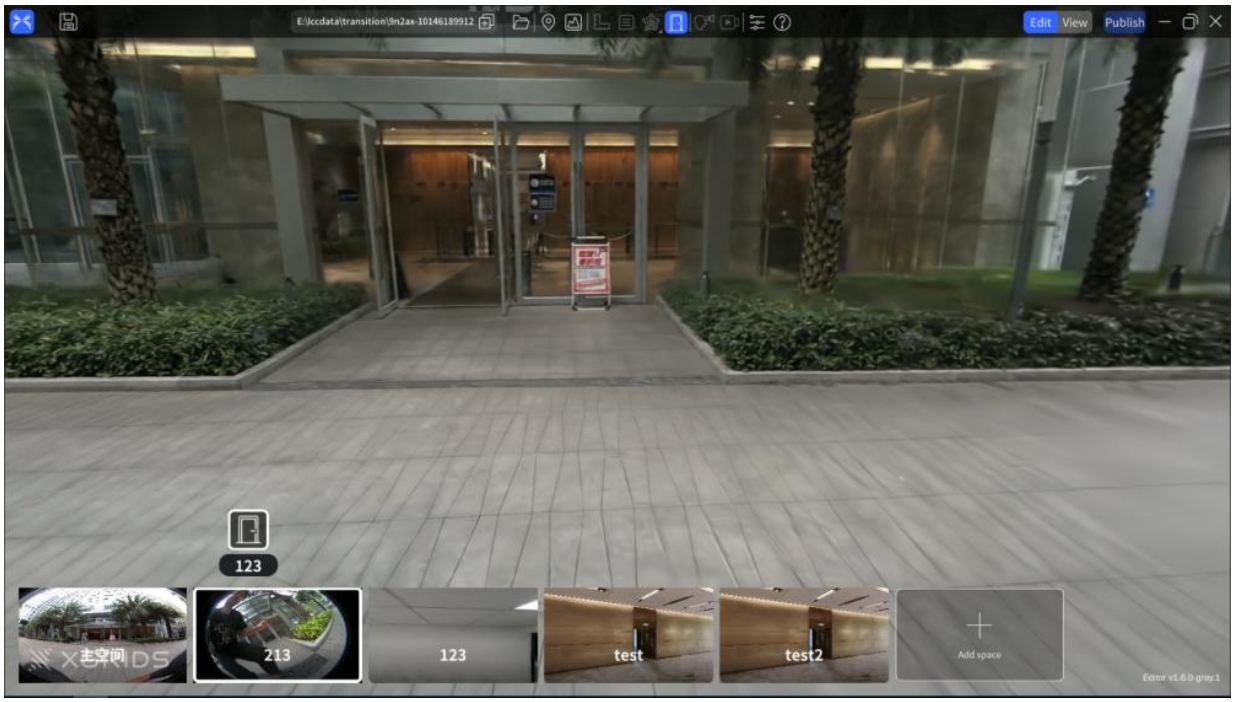
- After entering the space model, the "Portal" function is activated by default.

At the bottom of the window, a "Space List" pops up. Click "+", click "Add space", enter the space name, and select the corresponding file to upload. Finally, "OK" to successfully add the new space.



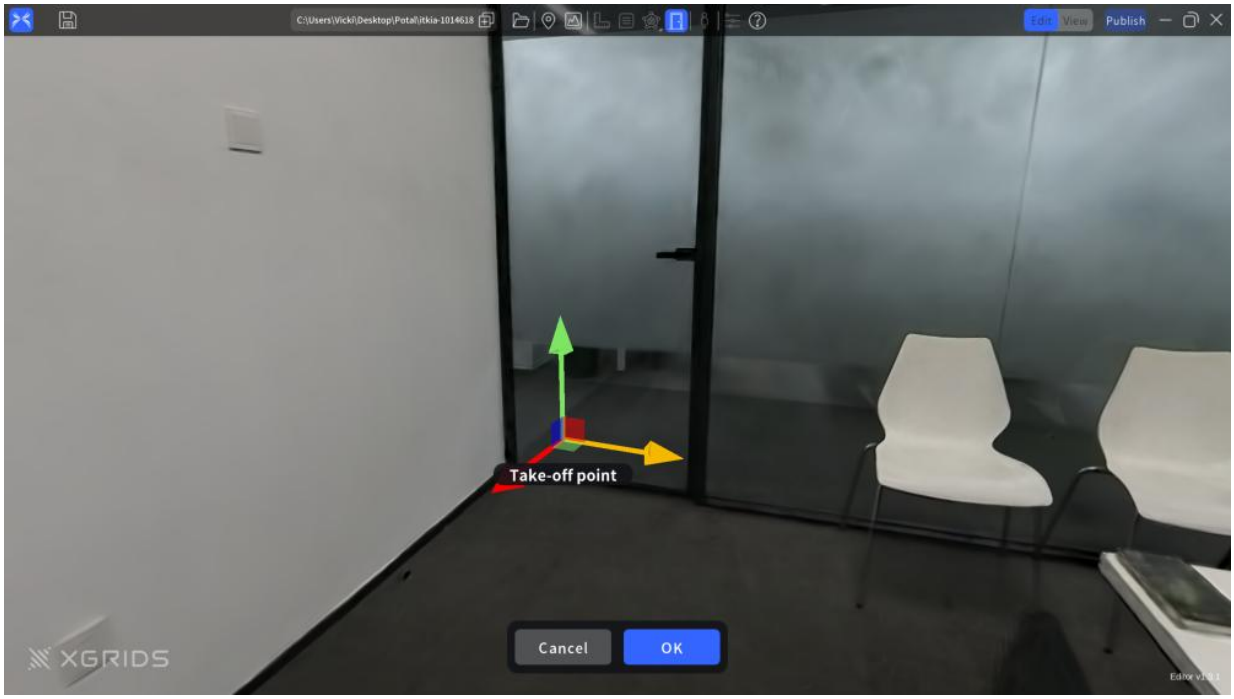
- The space list supports viewing and managing all available portal spaces.

In the space list, click the [×] in the upper right corner of the space to delete the scene space. Once deleted, the portal settings and space association with that scene will be terminated by default.

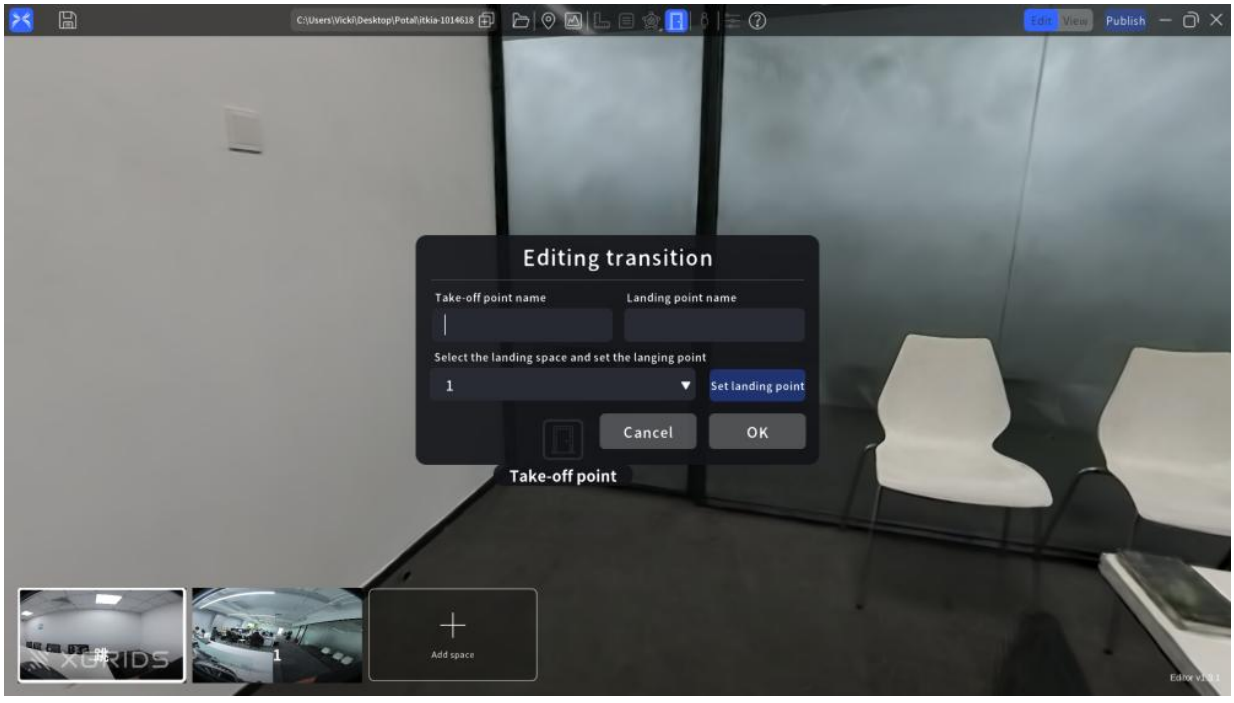


(4) Configure the portal and space model

- On the initial model, choose a "Take-off point", which supports "Translation" and "Delete".

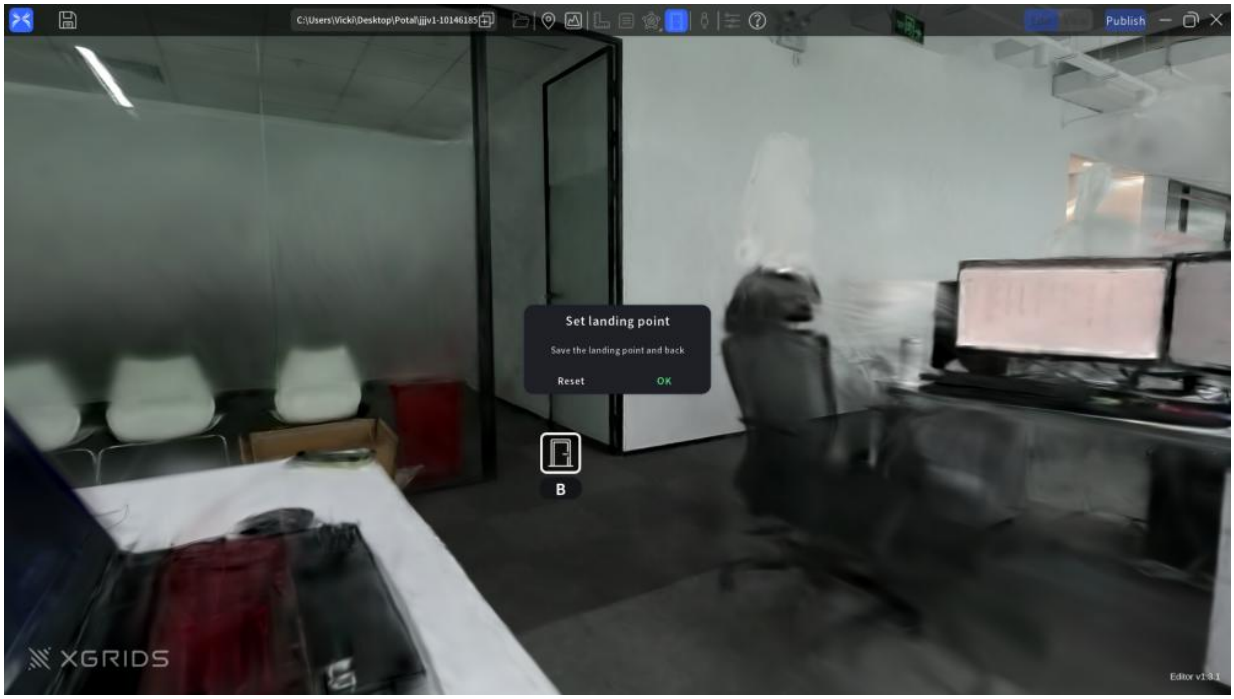


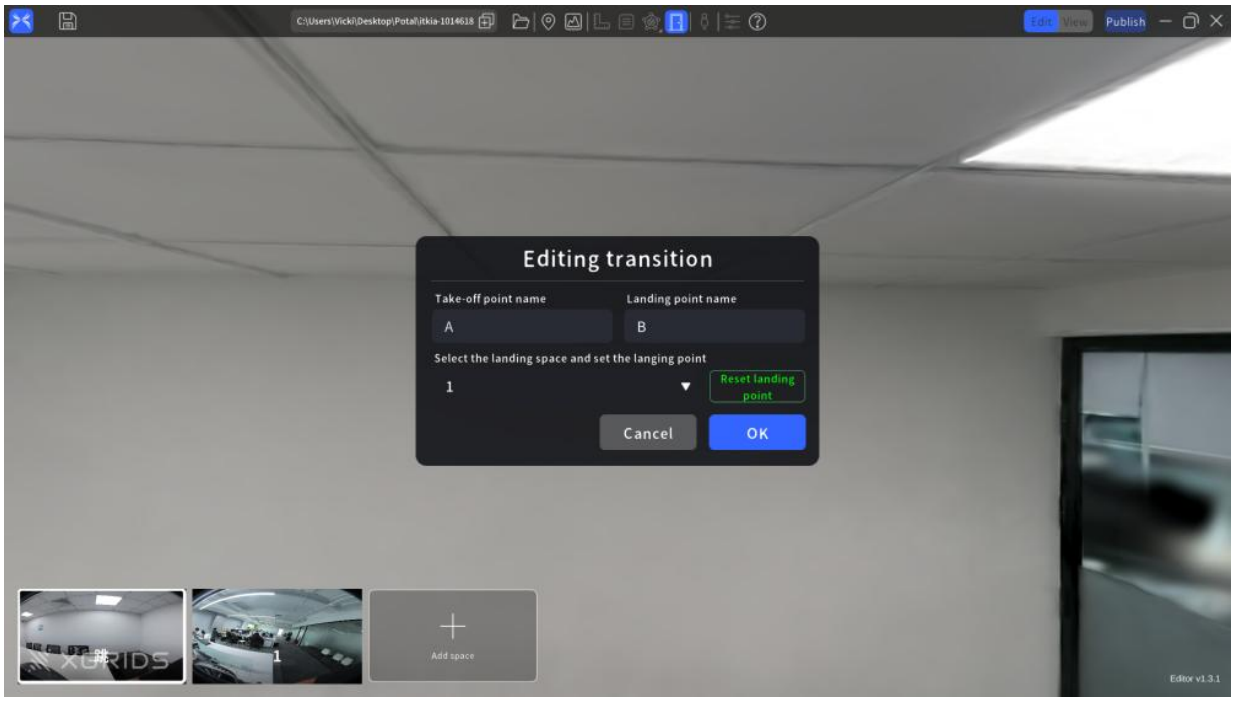
- After setting the "Take-off point", enter the corresponding information, select the landing space to jump to in the scene list, and set the landing point at the same time.



(5) Set the landing point of the landing space

- Clicking "Set Landing Point" will let you get into the selected landing space. After setting the landing point and confirming its location, confirmation will be returned immediately and confirmed again at the jumping point.

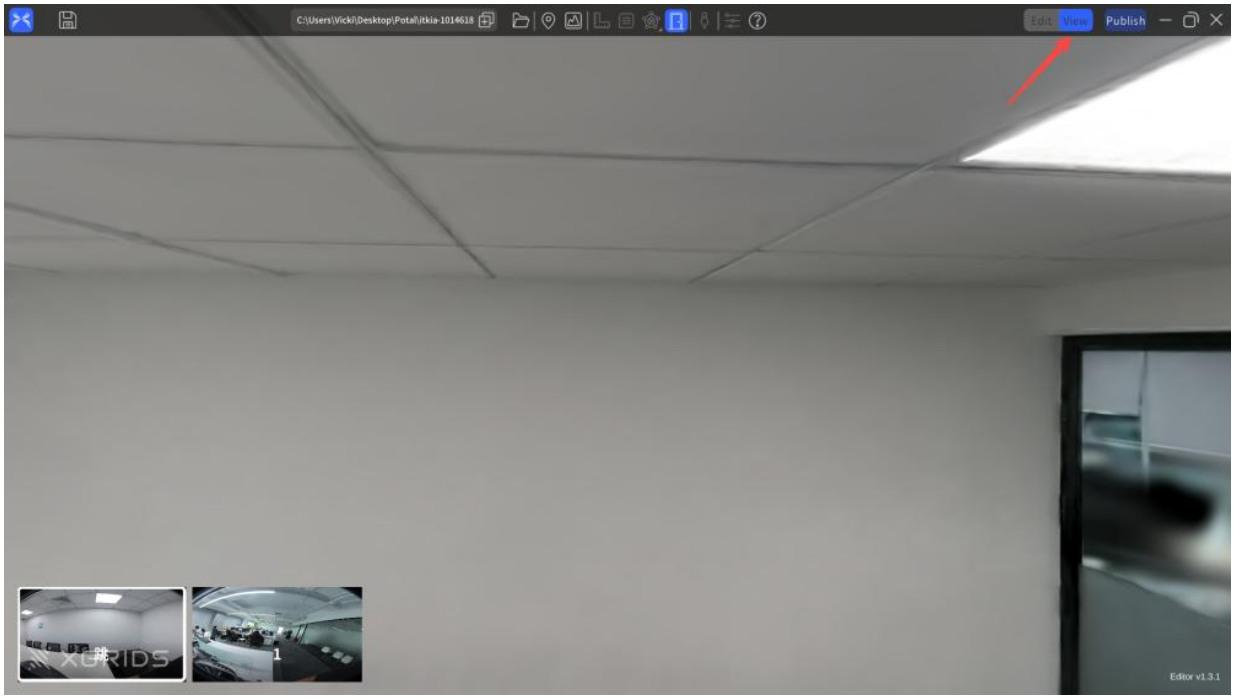




Note: Click [Reset Landing Point] to go back to the landing space and set the landing point again.

(6) Preview the portal effect (view)

- After completing all portal configurations, users can view the result on the right side of the top menu bar. You can preview the portal effect set by the user in time.



(7) Notes

- If there is an error prompt when creating a portal project, please follow the prompt to find the cause. This may mean that the uploaded file does not meet the requirements or there is a problem. Please check the file format, size, and content, and upload it again.
- The result of the portal setting is a series of models and portals relationships, and the [publish] function is not currently supported.
- Only one portal channel is supported between single spaces
- The portal function is recorded in real time in the file project directory without storage. The file format is: transition.lct
- In viewer mode, the portal project viewing and preview status are the same. The "Scene List" is activated by default, and clicking the "portal" can hide the scene list.