simactive

HIGH-END PHOTOGRAMMETRY SOFTWARE

HANDLING MULTI-CAMERA SETUPS WITH CORRELATOR3D™

1 Overview

Correlator3D (C3D) has supported multi-camera systems for over a decade, with renewed interest emerging as smaller format configurations hit the market. A crucial aspect of importing multi-camera systems successfully is understanding the relationship between the different cameras.

Using multi-camera setups with C3D offers significant benefits, primarily because oblique cameras can reduce shadows in point clouds, enhance density, and capture more information on vertical surfaces. However, these cameras add limited value to nadir products like DSMs, DTMs, and orthomosaics. In such cases, C3D allows users to disable these additional images, depending on the desired output.

This guide will outline the steps to create a project in Correlator3D using multi-camera systems. It will also discuss validating the input dataset to optimize output quality and reduce processing time.

2 Project setup

Importing imagery represents a critical step when working with multi-camera systems. It is essential to recognize that the different cameras are physically connected within a camera mount, functioning collectively as one camera group. This configuration can be established in C3D during the initial step of project setup, where users can add multiple cameras and assign them to one or several groups. For multi-camera setups, it is advisable to create only one group.
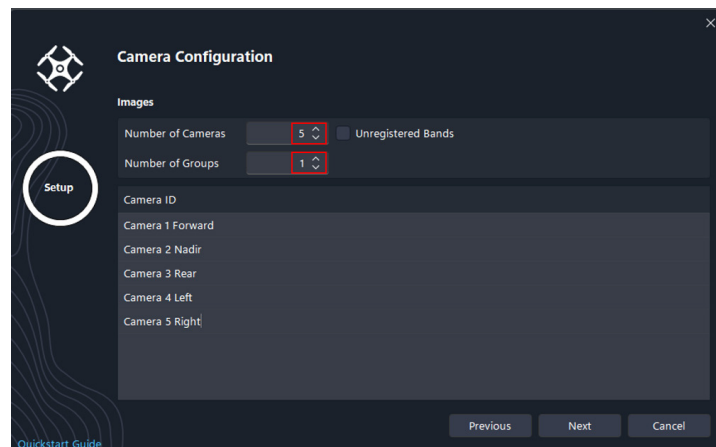

Figure 1: *Five cameras, one group*

The initial setup of a new multi-camera system requires meticulous attention as users must accurately determine the orientation of each camera within the mount and their respective relationships to the drone or aircraft's direction of travel. This involves determining the rotation values for each camera in the mount, a task that requires precise execution. Follow these steps to ensure accuracy:

1. Separate your images into individual folders based on their camera position, e.g., forward, nadir, rear, left, and right.

2. Create a project using only one camera, such as the forward camera, and apply all default settings. Ensure the camera mount value is set to zero. This configuration will visually represent the flight lines and their direction, and allow viewing any image within the project overlaid on online imagery (which is enabled by default in the directory tree).
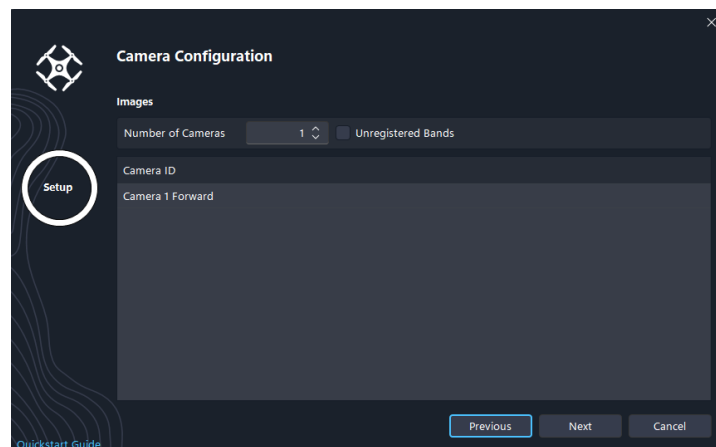

Figure 2: *Single camera labeled, Camera 1 forward*
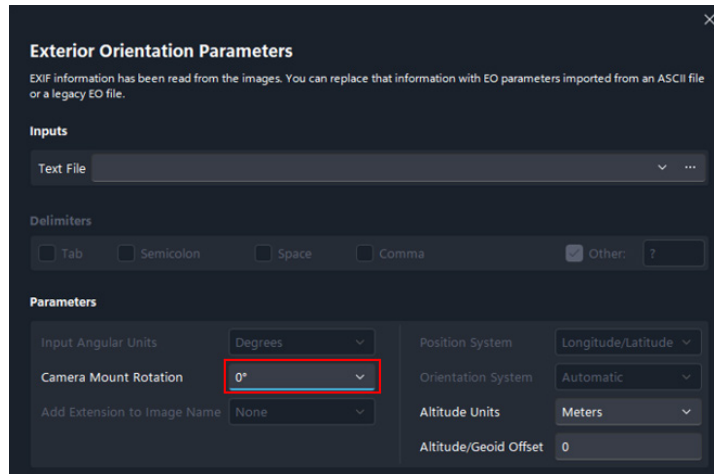
Figure 3: *Camera mount rotation selection*

3. Right-click on an image location, represented by an arrow in the main window, to display the corresponding image. Assess its general orientation relative to the existing reference online imagery. The objective is to determine the necessary camera rotation (0, +90, +180, -90, or -180 degrees) to roughly match the image content to the online imagery. Record this rotation as it corresponds to the camera mount.
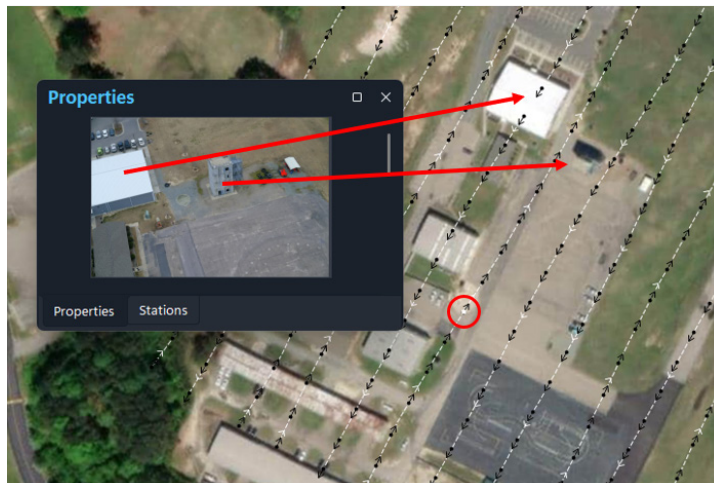
Figure 4: *Images rotation appears to match the online imagery and flight direction.*

4. Create a new project, add the same image folder, and this time incorporate the camera mount value identified in step 3 when importing exterior orientation for the images. Ensure the image content now approximately aligns with the existing reference online imagery.

5. Repeat the steps for each camera folder, documenting the required camera mount values.

After determining the camera mount angles for each camera, create a new project with all cameras assigned to a single group. During the camera setup, users can rename each camera for easier management. For instance, cameras can be distinctively labeled as follows:

Camera 1 Forward

Camera 2 Nadir

Camera 3 Rear

Camera 4 Left

Camera 5 Right

Labeling each camera distinctively is advantageous, especially when needing to disable specific photos or those within a flight line later in the project. It is also beneficial to include the camera mount angle in the name, for example, "Camera 4 Left -90". This naming convention aids during the import process and helps in navigating the project directory tree.
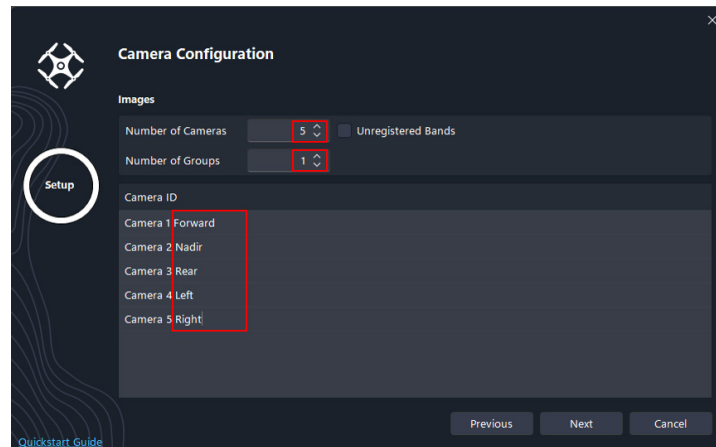

Figure 5: *Cameras labeled and in one group*

Each camera group's images should be imported with the corresponding rotation specified during the import. The remaining steps for setting up the project are consistent with any other camera configuration: defining the projection and adding ground control points (GCPs).

3   Reviewing imported data

Once the project is set up and displayed on the screen, users should see flight lines with arrows at each image location indicating the direction of each camera. The final validation should be performed as follows:

1. In the project directory tree, deselect all cameras except one (e.g. Camera 1 Forward 0).

2. Right-click and select an image located preferably in the middle of a flight line to view it in a separate window. Ensure the image content aligns approximately with the content in the online imagery.
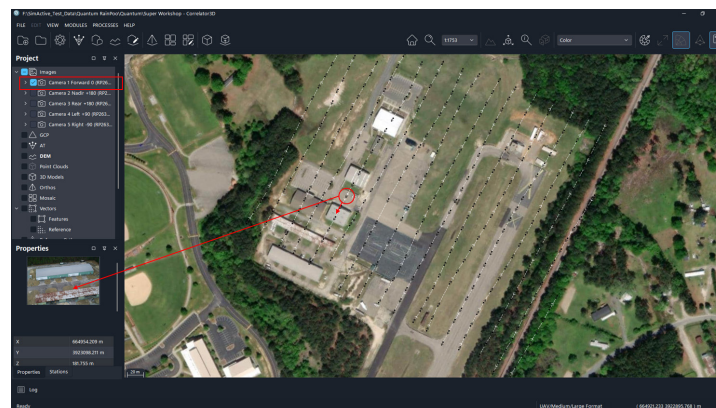

Figure 6: *Confirmation of correct rotation of imagery in Camera 1 Forward.*

3. Repeat this process with the other cameras.

If all cameras appear to follow the direction of flight with the correct rotation applied, then project setup up is complete, and users should continue to the aerial triangulation module.

4　Step-by-step processing in Correlator3D

Once aerial triangulation has been completed, it is recommended that users manually progress through each subsequent step (e.g. DSM generation, DTM extraction, orthorectification, mosaic creation). However, oblique imagery may adversely affect some outputs. Consider the following options when working with multi-camera systems:

• Disable oblique images when generating DSMs, orthophotos, and mosaics. While these images do little to enhance these outputs, they can significantly increase processing time.

• Enable oblique images for point cloud generation. They contribute to add additional points along the facades of structures, enhancing both visual quality and precision.

• Enable oblique images for 3D model generation. They provide additional texture along the facades of structures, enhancing the visual quality.