Registration Procedure of SCENE Data in Polyworks

Overview

Registration can be done in FARO® SCENE or in Polyworks. This procedure assumes you are going to do the aligning in Polyworks, but even if the scans are already aligned in SCENE, you can still bring the individual point clouds in (using this exact method if you like, or modified to reduce the unnecessary steps) and further best fit them.

NOTE: Pre-process the scans for noise etc in scene as normal, but avoid sub-sampling (or keep it to a minimum) as the data could be really sparse once Polyworks has done its thing as well.

Remember that LS Data is in Meters, so:

1m = 1000mm = 100cm
0.1m = 100mm = 10cm
0.01m = 10mm = 1cm
0.001m = 1mm = 0.1cm

The point clouds will be brought in one at a time, converted to images, filtered and further cleaned up, then aligned.

Details

To be more efficient with memory, Polyworks converts the point clouds to images as part of the import process. This is where its power lies in being able to handle huge point clouds. It does sometimes feel that you are taking extra steps that don’t seem to be intuitive or getting you closer to your goal.

1. Open the Polyworks v10 Workspace Manager
2. Create a workspace, or open a previously created workspace.
3. Using the Wizard, Follow the path: I want to … Acquire or Import Point Clouds … Import and align 3D digitized datasets …
4. IMALign starts and the Import 3D Digitised data sets dialogue opens automatically
5. Choose Spherical Grids … FARO LS …
6. Click the browse button and navigate to your desired data folder or:
   1. Start IMAlign .. Once open click File, Import Images, 3D Digitised Datasets
   2. When dialogue opens, Choose Spherical Grids … FARO LS …
3. Click the browse button and navigate to your desired data folder

**Importing the File**

Select the first file to import.

You will be asked **Do you wish to subdivide by range incoming images?**

If data is all within one area or at a similar range, for example a building façade or a wall, respond **No.** In all other cases, respond **Yes.**

If you respond **No:**

- **Interpolation step** – This should match the point to point distance across the range as far as possible. I find 0.01 to be a good starting point and then adjust as necessary
- **Max angle** – 89.9 (maximum)
- **Max edge length** – Point to point distance in line with range, dependent on level of detail to be preserved/depleted. I find 0.02 a good starting point and then adjust as necessary
- **Subdivision angle** – Polyworks recommend 20 and reduce if scan is very detailed, increase if not detailed. I find that I need to reduce to 10 (the minimum) for all scans
- **Subsampling Factor** – this is scan dependent and is your call, depending on sum total size of all data from all datasets to be imported (1/1, 1/4, etc)

The dataset is imported with no further interaction. Repeat for all scans to be imported.

If you respond **Yes:**

- **Max angle** - Adjust to 89.9 (maximum)
- **Subdivision Angle** - Polyworks recommend 20 and reduce if scan is very detailed, increase if not detailed. I find that I need to reduce to 10 (the minimum) for all scans
- **Subsampling factor** – this is scan dependent and is your call, depending on sum total size of all data from all datasets to be imported (1/1, 1/4, etc)

Dataset is imported and further interaction is required through the **Subdivide by Range** dialog:

Set the Elevation axis, the LS default is the Z axis but can easily be confirmed by the trihedron at the top lhs of the screen. Amend as necessary.

Click **Use Sliders** to insert Min/Max slider dialog at top of screen. Use the sliders to set a red circle at min distance and a red circle at max distance. Notice that the values in the Minimum and Maximum distance boxes update to reflect the slider position. You can enter values directly into the boxes if you wish. Setting the range limits is useful because you can use it to easily discard near or far data that is of no interest, or is obviously noisy.


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Set Focus distance. Polyworks recommends setting it to approximately half the minimum range, this will automatically calculate the “step at focus” value. It may be better to set the Focus distance shorter than this (0.25) so the data doesn’t get too sparse. Note: You can set it to less than the minimum range.

Set max edge length to approximately 10x step at focus. 10x only works if you set the Focus distance very short, or the data becomes very sparse. On a longer Focus, reduce the multiple.

Set number of ranges so that green “range” circle step size is fairly uniform up to the range limit. If you add ranges and no new circles appear, the new range step is outside the max range limit.

The “minimum interpolation step” should not be smaller than 2 times the scanner’s standard deviation with 0.01 being a good starting point. Adjust as necessary.
Click Update. Check that all is in order, make adjustments as necessary and then click OK.

If the data comes in too sparse, try again with smaller subdivision angle. If the data is already sampled in the scene, you may need to adjust the values to interpolate more density.

You can re-interpolate the individual scans within the dataset without having to start over, by right-clicking the required scan sub-images(s) in the Treeview, and selecting the Interpolation tab of the Properties window. Amend the required parameters as necessary and the sub-image(s) will be re-interpolated.

Clean-up and filter scan as necessary.

Aligning Scans

Bring in the next scan following above procedures. You can hide the previous scan(s) to make data clean-up and filtering etc easier to manage if you want.

Make just 2 scans visible.

- **Align, Split View** enables you to interactively translate and rotate the scans into approximately the same orientation. This will save you from unnecessary mouse work to pick the same point in the two files.
- **Align, N Point Pairs** allows you to pick at least 3 matching pairs of points in the two scan windows to enable a rough alignment to be calculated. Try to make sure that all 6 Degree of Freedom are constrained. You don’t have to be too exact when matching the points. If you used paper or spherical targets, you could pick those at this stage.

Right-click in one of the windows to start the alignment process. The first two sets of scans will aligned.

**Show** another scan and **N Point Align** it to those already aligned.

Once all scans have been initially aligned, show them all.

Go to **Align, Best-fit Alignment and Comparison** and input parameters to enable all scans and sub-images to be best fit to each other.
Once all scans are satisfactorily aligned, you can progress to IMMerge to Polygonise the data.

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