PTGui Stitching Tutorial

Computational Optical Lab

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Dataset: MCAM of Ramona

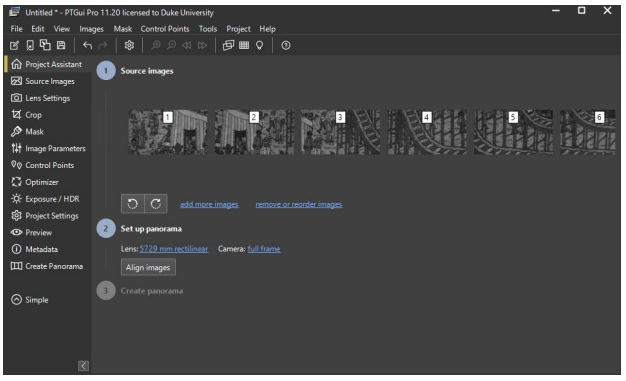
Download Software:

Download PTgui software from https://www.ptgui.com/

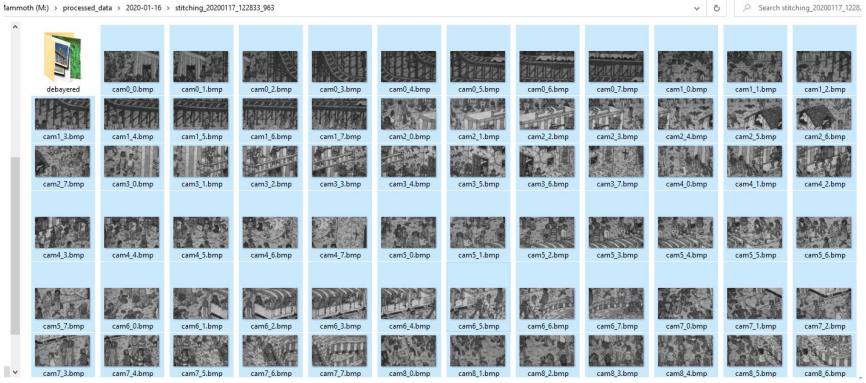
Generate the first panorama

1. Load Data & Set Parameters

1) In the Project Assistant Window -> Click load image and select the dataset(or drug and drop).

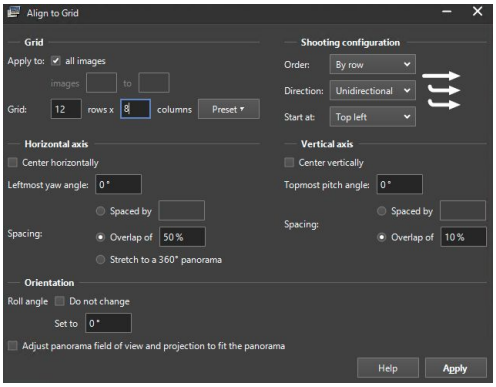


please make sure the data set is on the sequence they generated from camera, such as from cam0_0.bpm to cam11_7

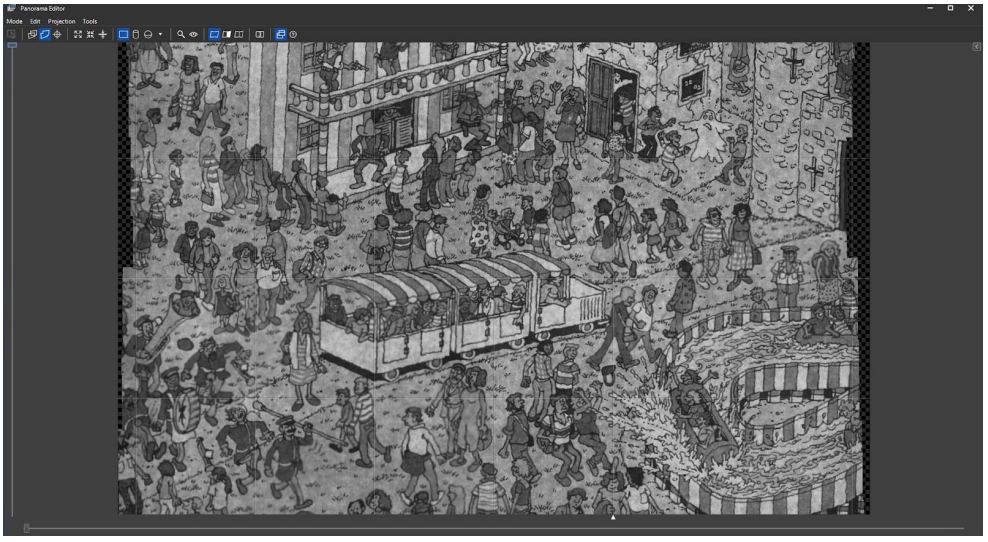


At that time the new downloaded PTGui may jump out a Camera sensor window: just cancel it, will be fine with defaults.

2) Click Project -> Align to Grid to set grid N rows x M column (enter numbers).
For example: the MCAM has 12 cameras in row and 7 cameras in column, so the dataset is from cam0_0 to cam0_7 in column and from cam0_0 to cam11_0 in row, for which N = 12 and M = 8.
- Also enter overlap numbers (50 for x and 10 for y seem to work).
- In shooting configuration you can set the stitching direction, the default setting shown. below works best for MACM datasets.



3) After setting the grid, click “Align images” under the Set up panorama to generate an adjustable panorama, it may take a minute for large data.
The new panorama will be shown on Panorama Editor window, in which we can make some manual adjustments to the image.



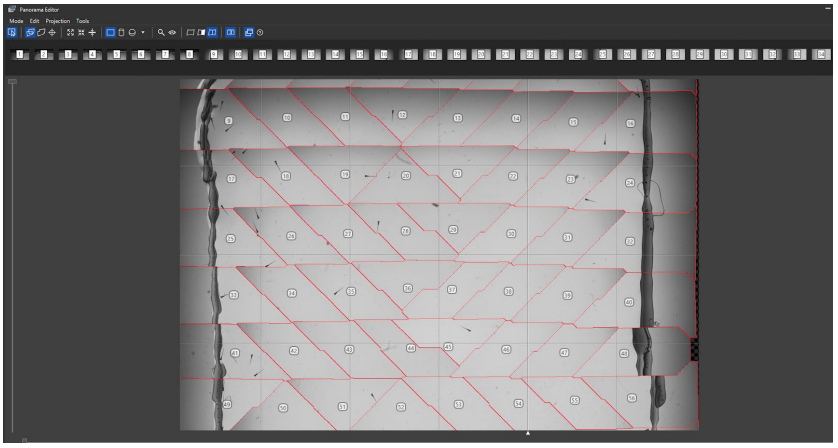
If the stitching result looks perfect, great! Just go to the next part: create the panorama. However, in most cases we need to do some adjustment manually which can fix flaws by algorithms, the details are in the following.

2. Manually Adjustment Guide

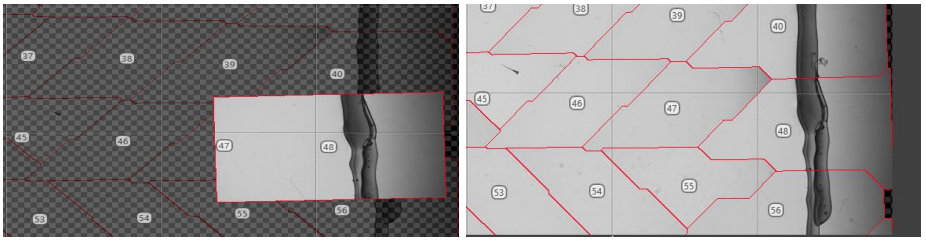
1) Image movement and deletion：
After opening Panorama Editor window, turn on the *Edit Individual Image* and

Show Image Numbers buttons on the top bar, now we can see the image numbers and operate on individual images.

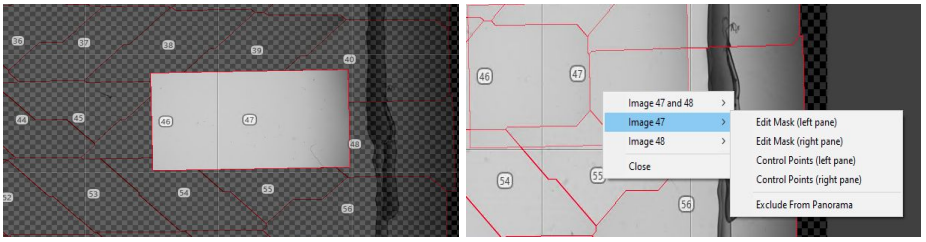
Now we can operate the stitching result manually. As shown below, PTGui stitches images by overlapping them one by one and uses the red lines to illustrate overlap edges of different images.



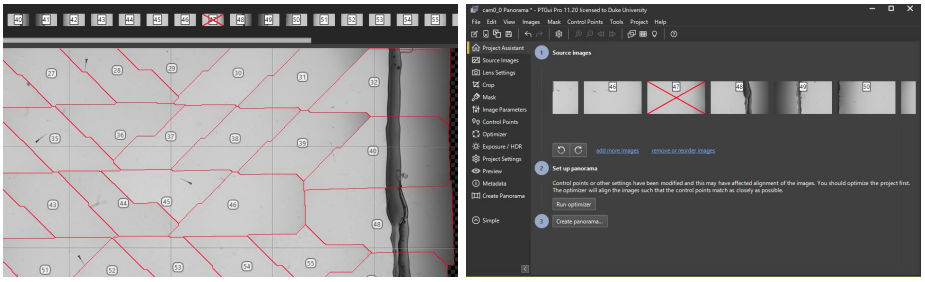
It's easy to see the No.48 image is misplaced. We can fix it by drugging it to the right and put it on the right place.



On top of that, we can also delete images to improve stitching quality without influencing the other parts. Just select the image you want to remove, and using right click to delete it from the stitching set. Since images overlap each other, the removed picture will be compensated by its neighbors.

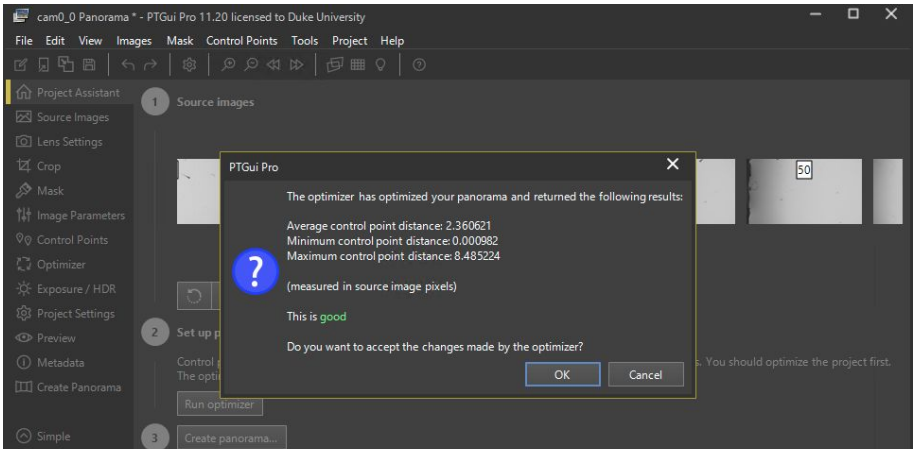


When the picture is deleted, the image part is removed from the stitching result, and a red cross appears at the corresponding position of the picture sequence.

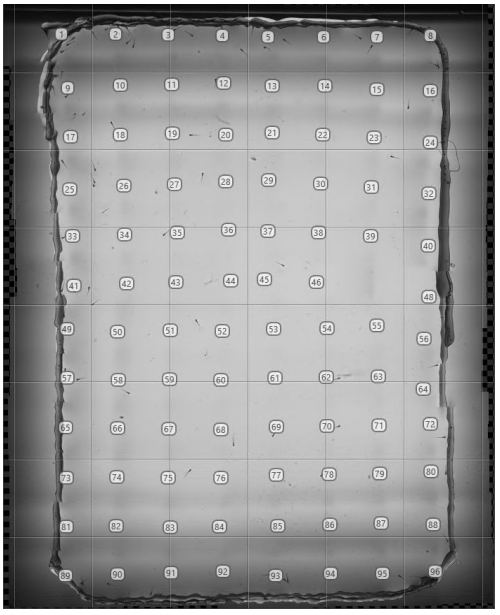


2) Optimize the stitching result：

After the manually operation, we change the stitching matrix, remember clicking *Run optimizer* to save and apply it to the dataset. The measurement appears on the window is not important, as long as the adjustments fit your needs.

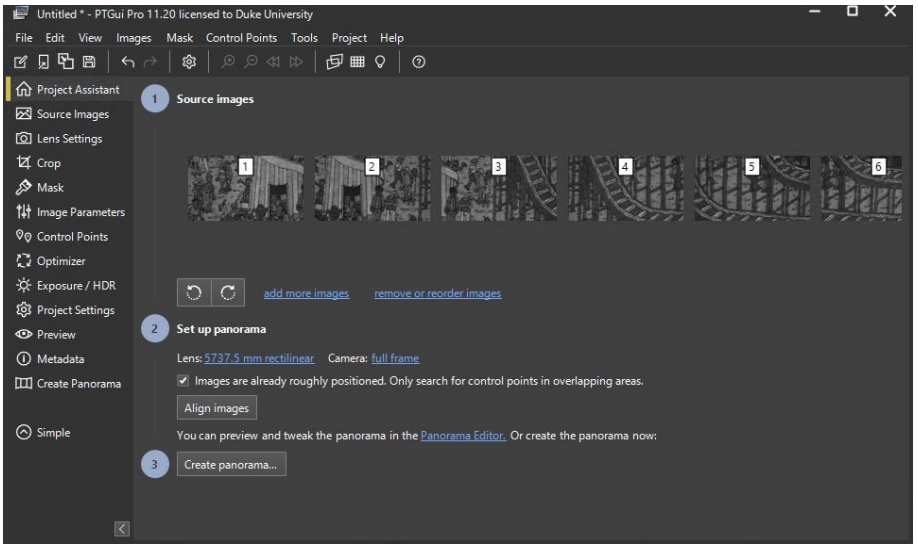


The final result is shown below:

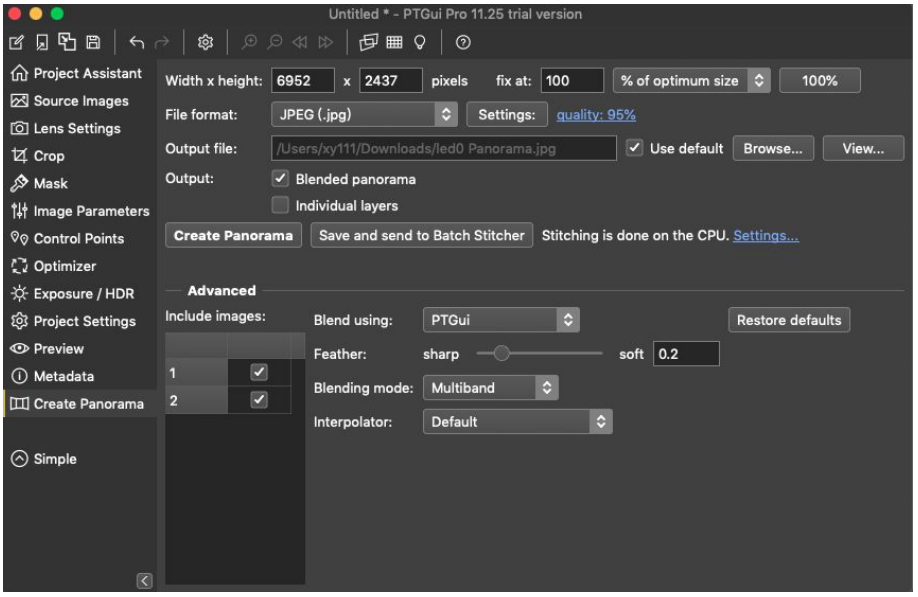


3. Create the panorama

Return to the Project Assistant window and click the button.



In the new window, we can set the output file format, blending options before generating the panorama. Note in this window we can change blending options if we want to make edges between sectors sharper of more blended.



Here are some default settings that worked well in previous experiments（Eric's stitching task）：

- Setting the output type as blended panorama, the individual layers option will return an overlap image of all the dataset.
- Blend using: PtGui (enblend and smartblend plugins were slow and worse)
- Feather: sharp (0)
- Blending mode: multiband
- Interpolator: seems bilinear is fine compared to more fancy ones like bicubic or spline36.
- File format（important when you need to process with large dataset！）: you need to

decide what best meets your needs in terms of the tradeoffs between memory/quality and memory/compression time. For the former, you can save a lot of memory going with jpg, and get pretty decent quality even at 95% quality (note even 100% jpeg isn't lossless). If you want lossless go with .tif but then you have to choose between memory/time to compress: lzw is smaller (400MB vs 1.2MB for packbits) in memory but takes longer to save and (especially) to open later. If you are doing super-detailed stuff save as tif. Note that PTGui automatically saves as rgb so to convert to grayscale you would need to use imagemagick or some other application.

After setting the default, we can choose Create Panorama to generate the stitched image, or Save and send to Batch stitcher to generate templates.

Stitching Based on Template

The biggest problem for stitching is that many datasets have large blank areas, which makes it difficult for the software to find corresponding feature points and leads to poor stitching results. To solve the problem, we need to get a well stitched dataset as template to calibrate the other datasets that lacks details.

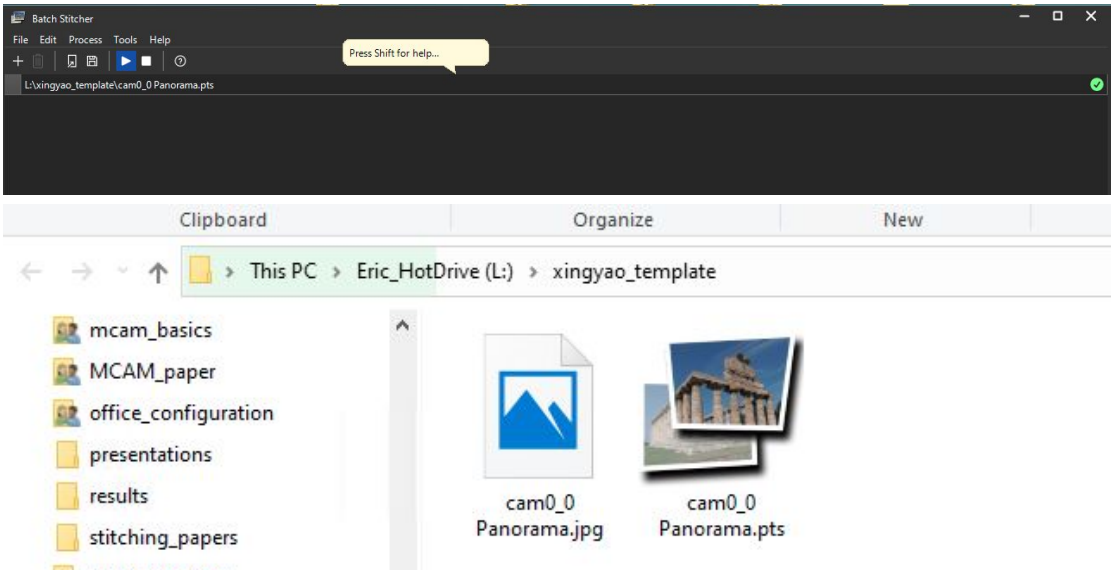
1. Generate the Template

Make sure the calibration dataset we selected as template obeys the following rules:

i. The calibration dataset should be under the exact physical condition as the datasets need to be stitched(the focus of the MCAM, the row and column number, no movement or blend during the data collection process, etc.).

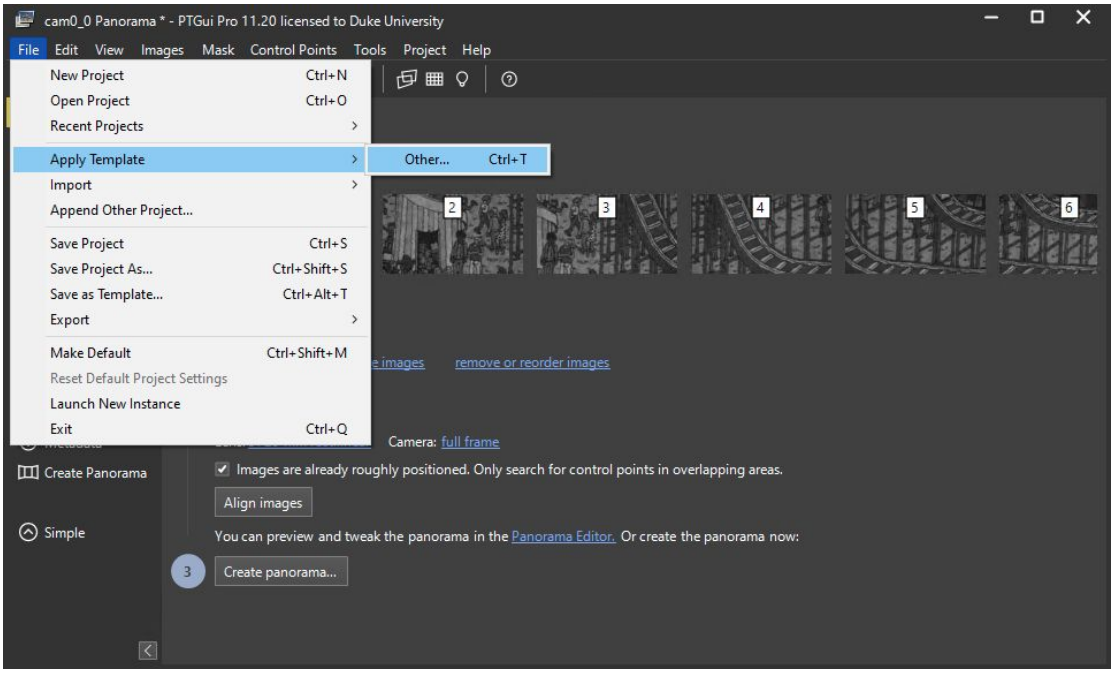
ii. The calibration dataset should contain a large amount of details which can increase the stitching accuracy. The image of where is the waldo? could be a good choice for most cases from my experience.

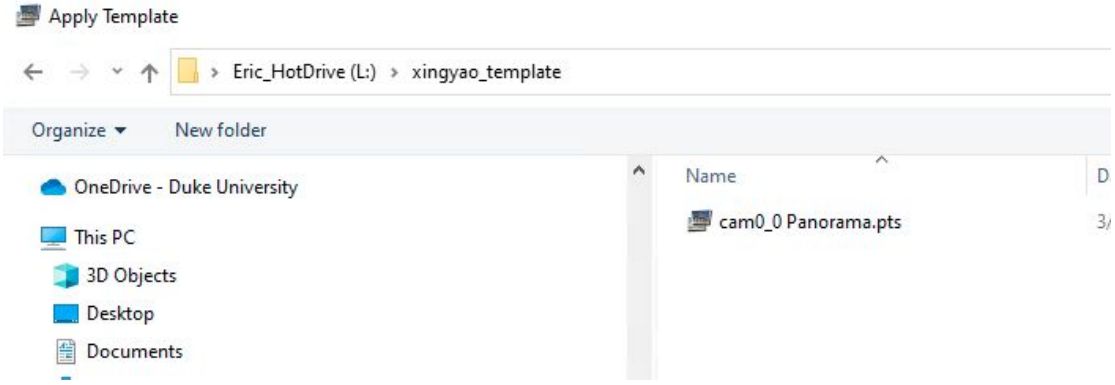
After determining the calibration dataset, repeat the 1st and 2nd steps. **Please notice that at this time, we select Save and send to Batch stitcher, this option will generate the .jpg image and .pts project at the same time. The .pts project is the exactly template we need.**



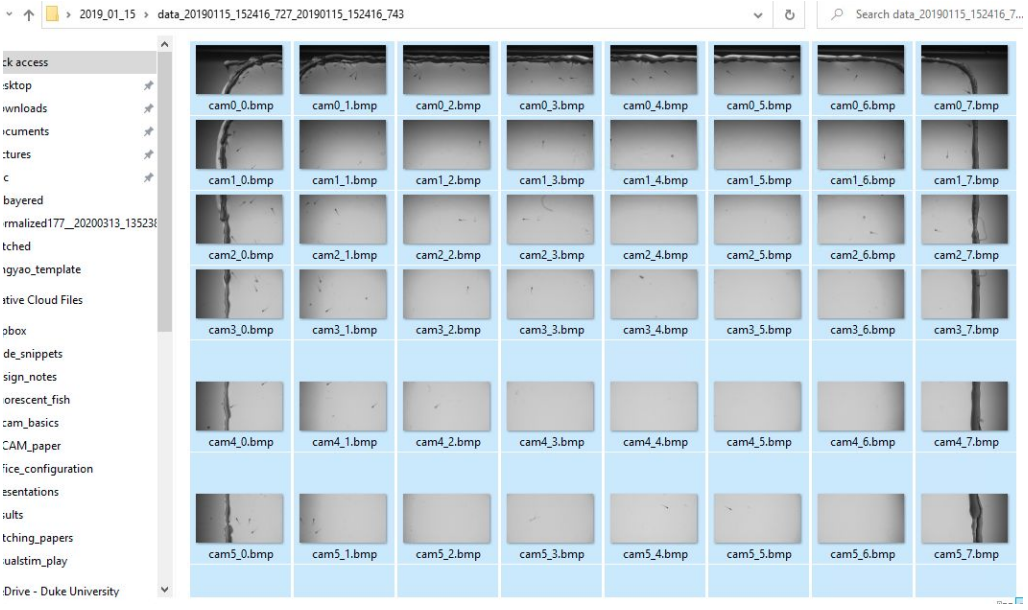
2. Using template for stitching

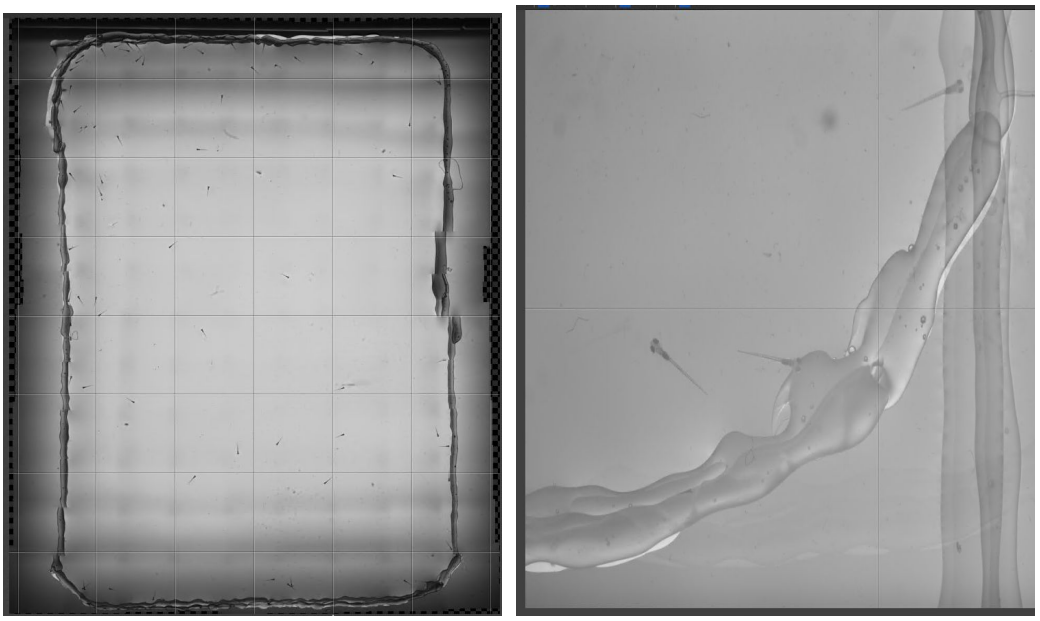
After load the dataset, open File -> Apply Template -> Other, find the template we save before and open it. Then return to the Project Assistant window and Align images.





Here we use fish dataset which contains a lot of blank area as a test, the calibration dataset is waldo image:



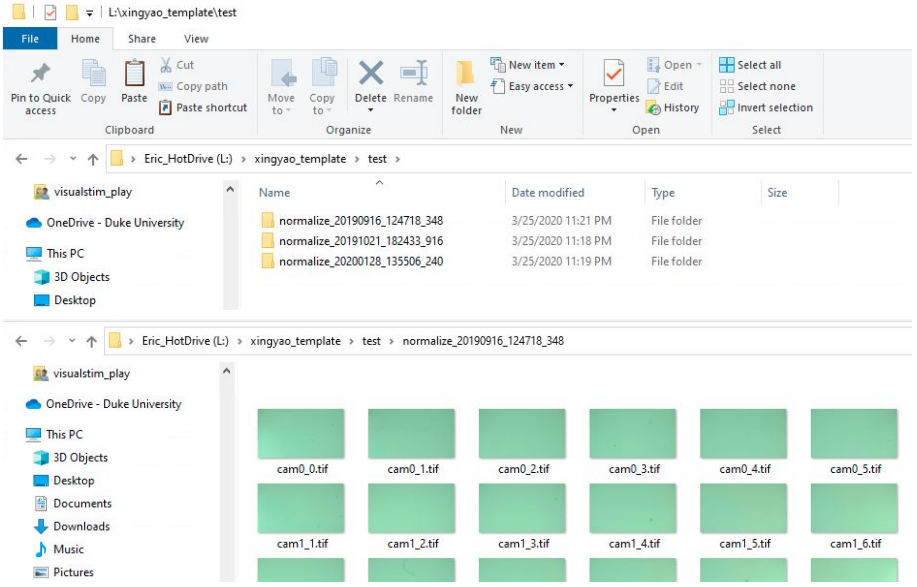


The left figure is the result of using template and the right one is the directly stitching result. 1. We can see that the directly stitching result is awful since the dataset contains few features. 2. the right medial part of template result has an obvious mismatch, it is because the template we use here is not exactly the template of the fish image, just for an example. However, even though we use the correct template, we may still can't get a perfect result due to the physical limitation of the datasets. In this case, we can use manually correction methods mentioned before to fix the error.

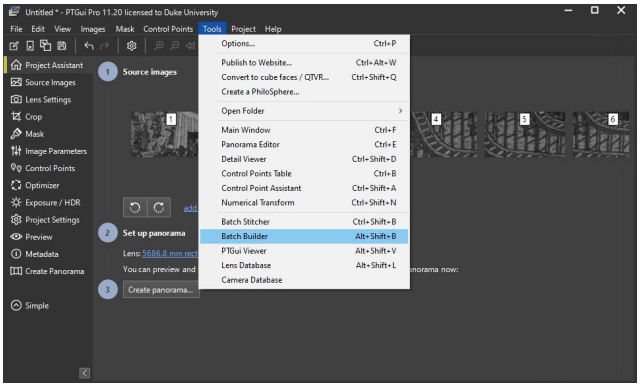
Batchsize stitching

The Batchsize stitching can stitch hundreds of datasets automatically at one time. The operation detail is as the following:

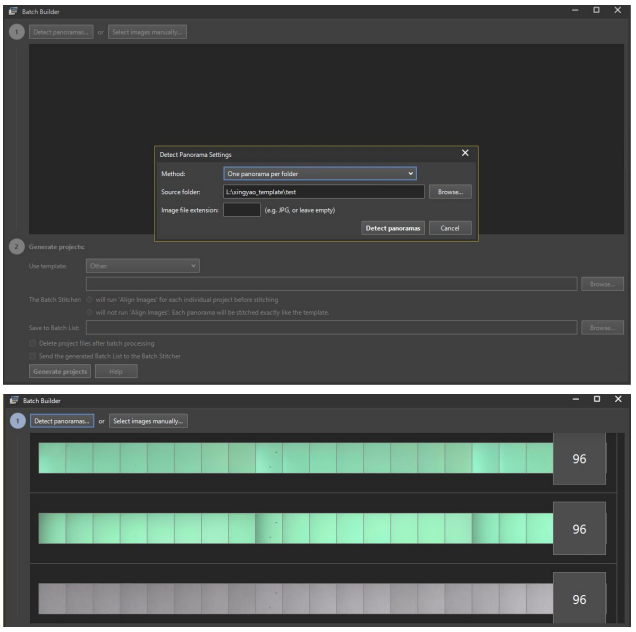
1. Put all the dataset folders you want to stitch in one folder:



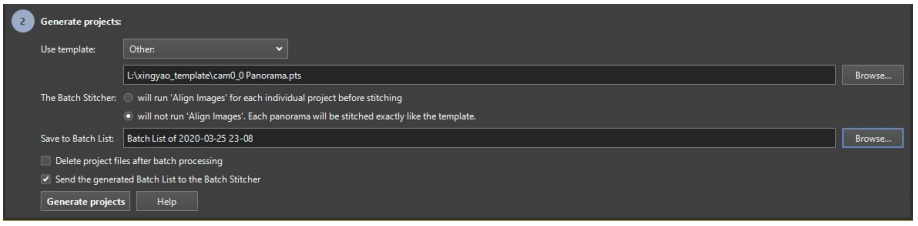
2. In original project window with data, Tools -> Batch Builder.



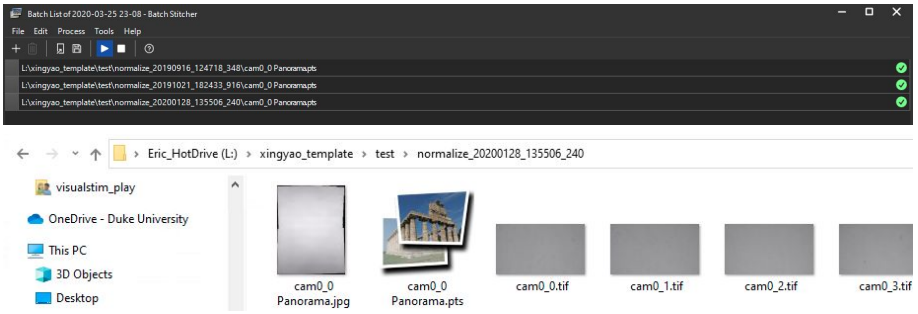
3. Detect Panoramas -> Pick the folder with all the image folders -> detect panoramas.
   a. Methods: One panorama per folder
   b. Source folder: Select the folder which contain all the dataset folders you need. (e.g. like the *test* folder shown above)
   c. Click Detect panoramas, all the datasets will be loaded in sequence.



4. In generate projects tab:
   a. use template: other -> select the .pts template which is suit for your dataset
   b. the batch stitcher: will not run align images (each will use the template).
   c. Click 'send the generated batch list to the batch stitcher so you don't have to click a bunch of times while it runs.



5. Click 'generate projects'. All the datasets will be stitched automatically and the stitched image(.jpg) as well as the project(.pts) will be saved in the corresponding folders.



Operation on command line:

Still working on this operation and contacting with PTGui company.
Note we have not tried this yet if you do please fill in details:
https://www.ptgui.com/support.html#6_32

Other discussions of this:
https://groups.google.com/forum/#!topicsearchin/ptgui/subject$3Acommand$20AND$20subject$3Aline/ptgui/iH4FbEcWP0w
https://groups.google.com/forum/#!topicsearchin/ptgui/subject$3Acommand$20AND$20subject$3Aline/ptgui/qDJPrNcQ9B4