

Recall of last meeting:

We talked about three problems last meeting:

1. Use DSF to replace the incremental landmark association.
2. Refactor the bundle adjustment with input data as a nested list of landmark association.
[[(image index, Point2())]]
3. Verify the correctness of the calibration:
Because I have already did unittest on calculating the reprojection error of the calibrate result.
Therefore to verify the correctness of the calibration we need to test:
 - a. The accuracy of reconstructed perpendicular lines
 - b. The accuracy of reconstructed perpendicular faces

1. Mapping with DSF

a. Incremental landmark association

(Only use input match data:

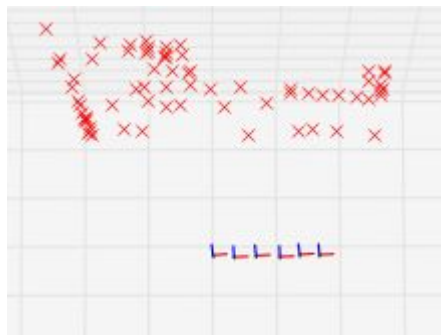
match_0_1,match_1_2,match_2_3,match_3_4,match_4_5,match_5_6)

Global Bundle Adjustment:

Landmark must be at least observed by 6 poses.



Along x axis



Along z axis

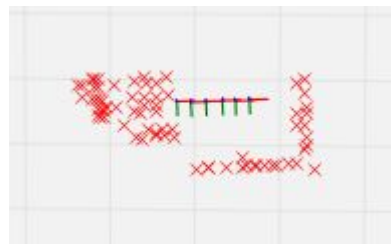
b. DSF landmark association

(Only use input match data:

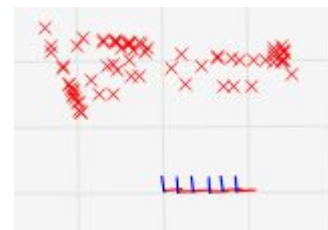
match_0_1,match_1_2,match_2_3,match_3_4,match_4_5,match_5_6)

Global Bundle Adjustment:

Landmark must be at least observed by 6 poses.



Along x axis



Along z axis

Conclusion:

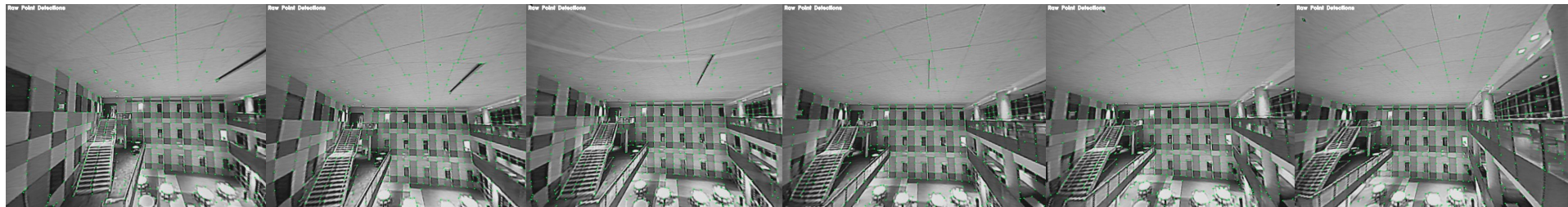
Because the left and right results are nearly the same, we can prove that the DSF is implemented correctly

1. DSF - Source images

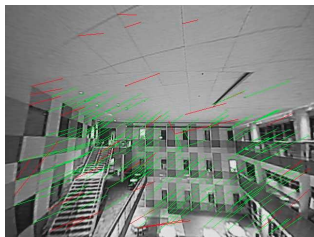
Source Images(6)



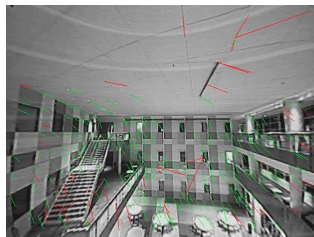
Undistort Images with extracted features



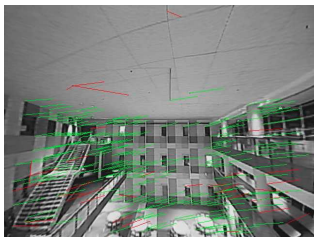
4d agriculture feature matches.



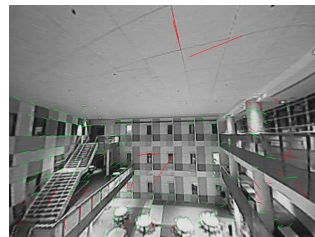
Match o_1



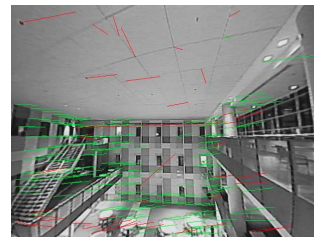
Match 1_2



Match 2_3



Match 3_4



Match 4_5

1. DSF - Finding best parameter

DSF landmark association

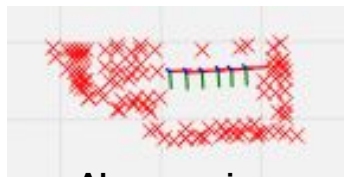
(Use all match data - feature match data of every image pairs)

Global Bundle Adjustment

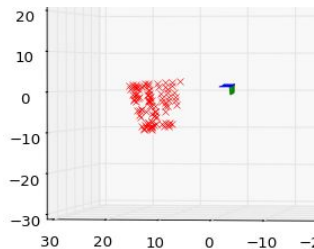
(the results are bad when number of observations < 5)

Landmark must be at least observed by 6 poses:

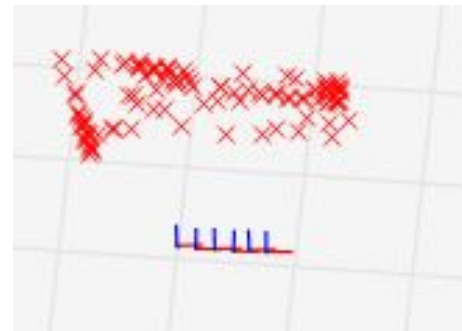
Referring to the world coordinate axes



Along x axis



Along y axis

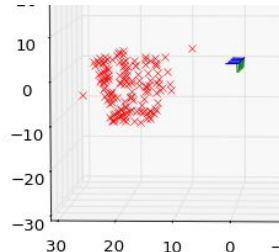


Along z axis

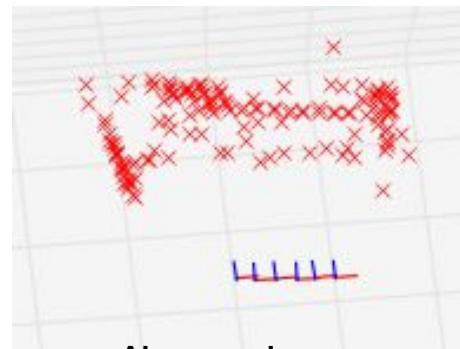
Landmark must be at least observed by 5 poses:



Along x axis



Along y axis



Along z axis

Conclusion:

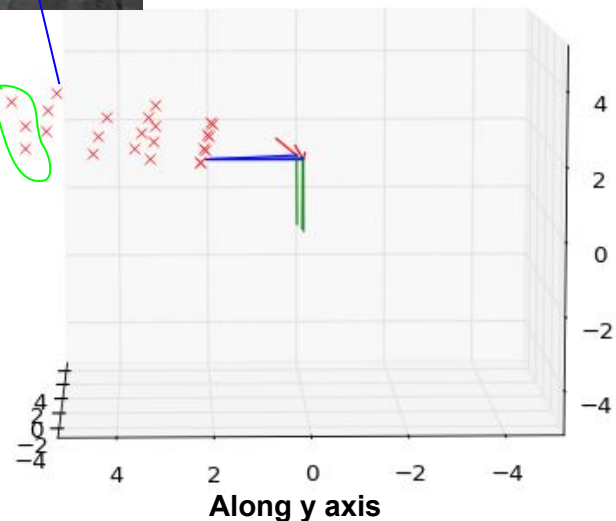
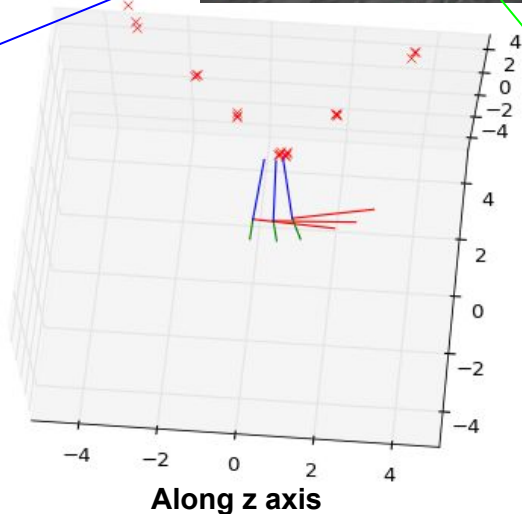
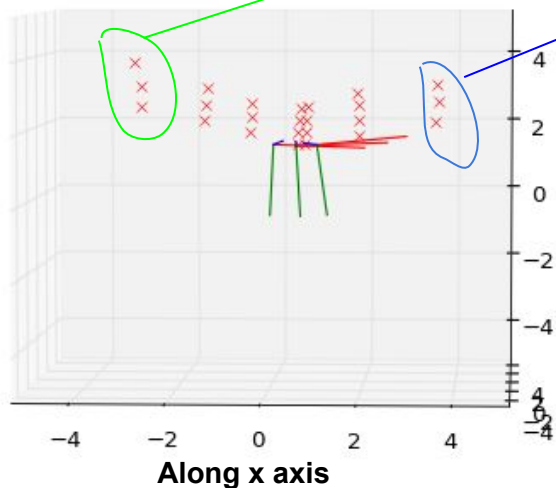
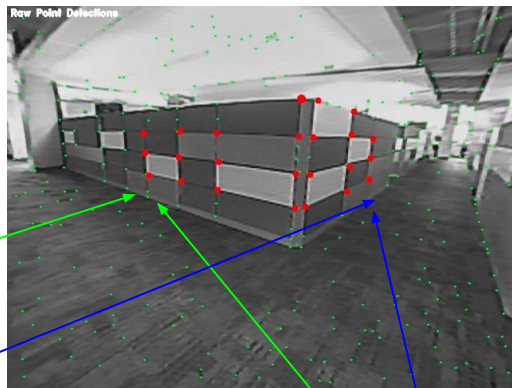
Bad feature matches will cause influence on the final result by creating bad landmark association.

Only using landmarks that were observed by a minimal number can improve the result.

2. Perpendicularity Verification:

a. Manually select matched Keypoints:

b. Global Bundle Adjustment Result:

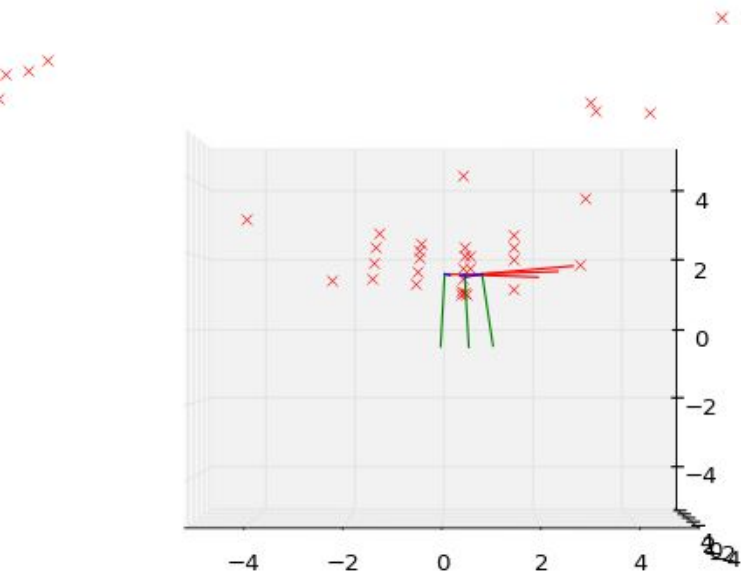


Conclusion:

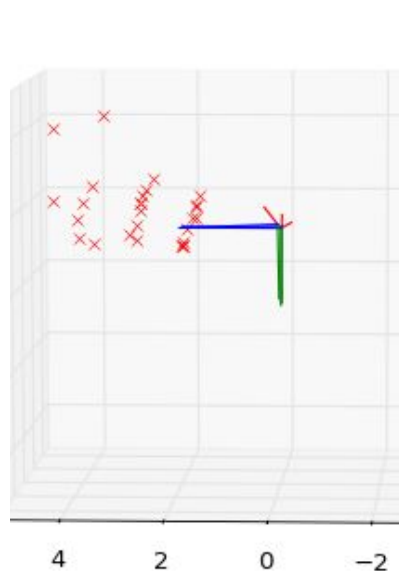
From the result of the perpendicular test, we can see that the image is still remaining distorted near the border. But, overall it can recover the perpendicularity of faces and lines.

2. Perpendicularity Verification(auto feature matching):

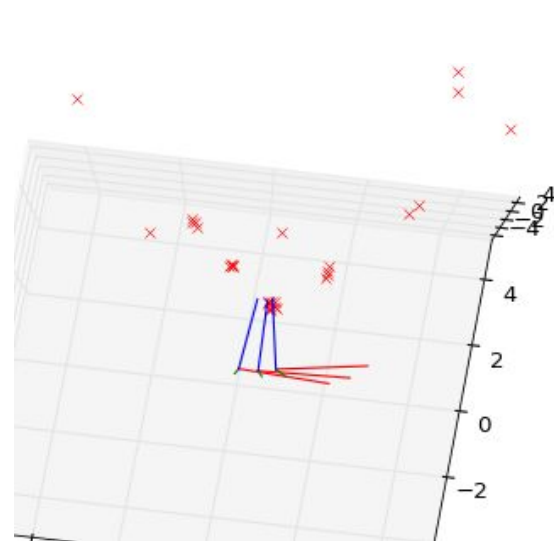
- a. 4d Agriculture data association.
- b. DSF landmark association
- c. Global Bundle Adjustment Result:



Along x axis



Along y axis



Along z axis

Conclusion:

Back projection depth, landmark minimal observation number and bad matches will all affect the result.