## Re: Calibration in the lab

Lotem Nadir <lotemn@campus.technion.ac.il>

Sat 9/18/2021 10:43 PM

To: Alon Zvirin <alonzvirin@gmail.com>

Hi,

Thanks for your answer.
Let's schedule for Sunday, 26/09 at 13:00?
Just want to make sure -

1. There is no way to find the calibration parameters for the already recorded videos? We can only estimate those parameters using Kabsch's algorithm?
2. For future recordings - If we calibrate the cameras at each session, we will have the projection matrix and will not need to use Kabsch's algorithm. Am I right?

As for the summary of my efforts - sorry for the short mail, let me go into detail. I've run the tests on several recording sessions. The following error rates are for a session with 19 annotated points. The error is RMSE between the annotated points and the projected points.
I've tried the following methods:

- Running Kabsch on entire pointset (19 points) - RMSE was **22.0343**.
- Picking "the best annotated points", i.e using only points i'm 100% sure about their annotation (16 points) - RMSE was **21.9403**.
- Automatically decreasing pointset size. Everytime I decreased the pointset size by 1, and ran Kabsch on it. The points were chosen each time brute forcely, i.e for pointset of size 15 I tried picking all 15 point subsets and calculated Kabsch on each subset. For pointset of size 14 I tried picking all 14 point subsets and calculated Kabsch on each subset, and so on. The best RMSE was **20.3458** for subset of size 10. For subset of size 9 the error rate was higher so i didn't continue to 8, 7, 6...
- Manually decreasing pointset size. I've manually picked smaller subsets of 6, 7 or 8 points and calculate Kabsch on each subset. The picking was not "systematic", but I tried picking points from different body parts, for example, one points from the left leg, second point from the right leg, third point from the head and so on. The error rates were higher (>24) for all these subset groups.
- Run Kabsch on entire pointset (19 points), calculate for each point it's RMSE, remove N points with highest RMSE, and re-run Kabsch. I've tried N values of {1, 2, 3, 4, 5}. Best N value was 2, which had RMSE of **22.1695.**
- Average of depth pixels surrounding the marked points - I've tried kernel sizes of 3x3, 5x5, 7x7. Best RMSE was **23.0545** for kernel of 3x3.
- Average the vicon points over frames. The best RMSE was for 3 frames - current, previous and next one. RMSE was **21.5602**.

2 more things:

- The changes in the error rates were similar for other recording sessions as well.
- Some of the realsense videos in our data have frame-drop at random places in the video. This is because 2 cameras were connected to the same laptop while recording, and the computer was not strong enough for this. This adds noise to the data, so I've also tried using different parts of the recordings, for example using the last frames of each session instead of the first ones. There was no improvement...

Thank you very much,
Lotem

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**From:** Alon Zvirin <alonzvirin@gmail.com>
**Sent:** Saturday, September 18, 2021 8:27 PM
**To:** Lotem Nadir <lotemn@campus.technion.ac.il>
**Subject:** Re: Calibration in the lab

Hi,

23/09 or 26/09 is OK, 12:00 or later.
No great improvement or no improvement at all?
Did you try to use only the "good looking pairs"? an average/median of pixels surrounding the marked points?
What error do you get ? (diff between marked and projected points)

For calibration on both previous and future sessions - I see no other way except using Kabsch on a set of points,
only thing is - we should get best possible accuracy of their locations, that's why i suggested placing the markers on a mannequin or tripod.

I think you should also write a summary of your efforts, Maayan and Ron K will expect it...

Alon

On Fri, Sep 17, 2021 at 12:51 PM Lotem Nadir <lotemn@campus.technion.ac.il> wrote:

> Hi Alon,
>
> How are you?
> I've tried using the methods you suggested me by phone, and there was no great improvement in the projection accuracy.
> Omer and I would appreciate it if you could join us in the lab and show us:
>
> - How can we find the calibration for the already-recorded sessions.
> - How to calibrate the cameras in next recording sessions.
>
> Are you available at 23/09 or 26/09?
>
> Shabat shalom,
> Lotem