1 What I've done

- Fixed my timestamp alignment code
- Wrote code to change frames
- Evaluated estimated trajectories compared to ground truth
- Checked my Kabsch implementation with synthetic data, it works well with no noise
- Started adding to the coordinate frames section of my report

2 Parts of report to look at

- N/A

3 Questions

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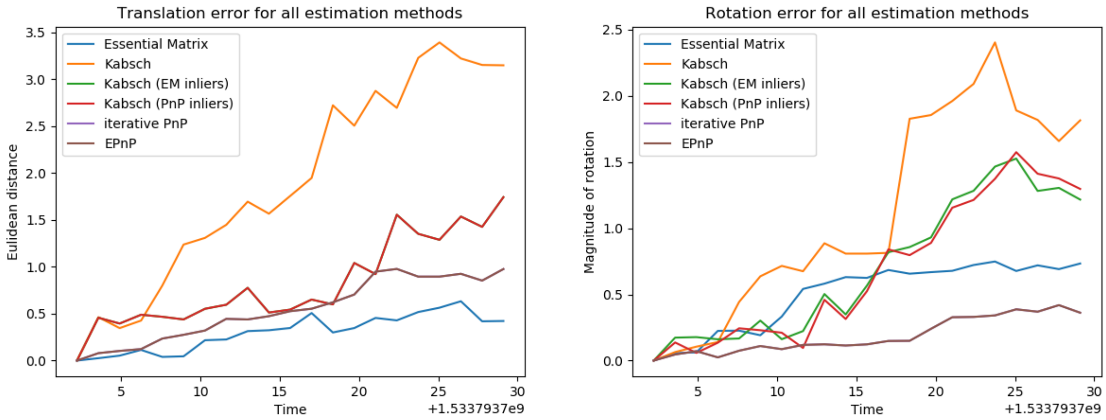
4 Comments

- Jean-Luc's code is fine, there was an issue with my time alignment code which I fixed this week.
- The control code is harder to compare to the ground truth, the fields are "timestamp x_vel_des y_vel_des vbx vby vbz vix viy viz yaw_des". I'll either research or ask Jean Luc how to get rotation and translation from this.
- I created some synthetic data and then rotated and translated it to get two point clouds. My Kabsch implementation with no noise recovers this rotation and translation with error of magnitude 10^{-15} for both the rotation and translation. So the issue is either with the RANSAC implementation and/or the data. Or possibly numerics?
- In order to get everything in the same frame for the registration, I save the trajectory in the world frame. First, I define two rotation matrices: the first, R_{c2q}, goes from the camera frame to quadcopter frame by rotating by 45 degrees around x. This allows me to plot the trajectory of the quadcopter rather than the camera. The second, R_{q2w}, goes from the quadcopter frame

to the world frame (using the quadcopter pose in the world frame). This is done using a rotation -90 degrees around z and then 180 degrees around x. So for rotation R and translation t, the update is done as follows.

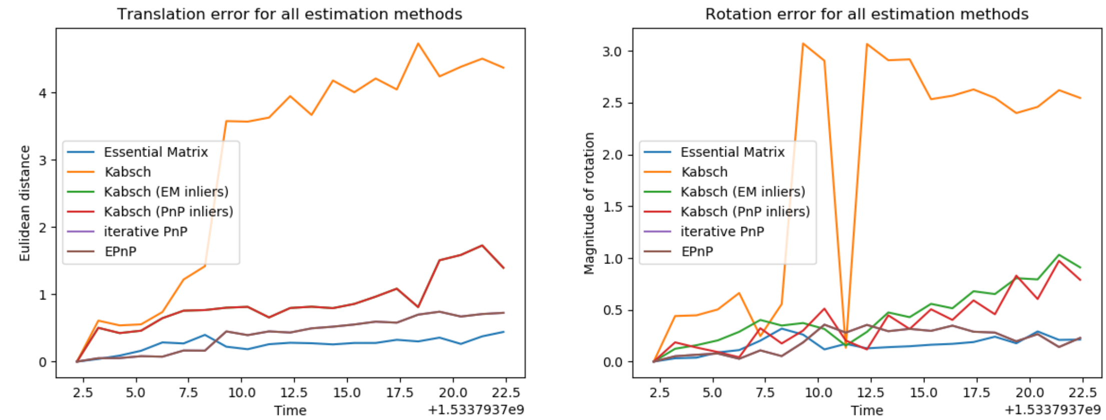
$$\begin{aligned} R_q &= R_{c2q} R R_{c2q}^T \\ t_q &= R_{c2q} t \\ R_{t+1} &= R_t R_q \\ t_{q+1} &= t_t + (R_{q2w}(R_q^T t_q))^T \end{aligned}$$

- Figure 3 shows the trajectories in the world frame (Figure 4 for Kabsch with different inliers), Figure 1 shows the transaltion and rotation error of each trajecory as a function of time.
- I think I mentioned this before, but the distance between frames is important (compare Figure 1 to Figure 2). The trajectory plots in this report are with 40 frames skipped.



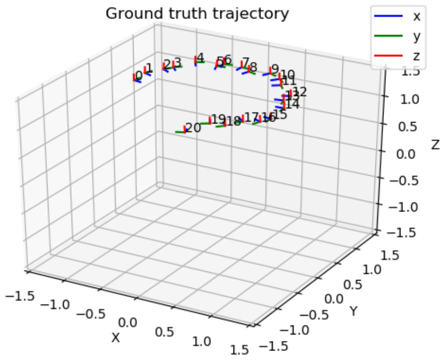
(a) Translation error (b) Rotation error

Figure 1: Vision error for various registration techniques with 40 frames skipped

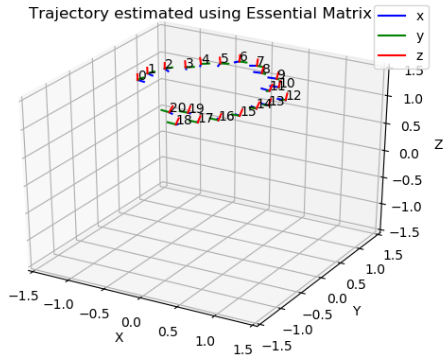


(a) Translation error (b) Rotation error

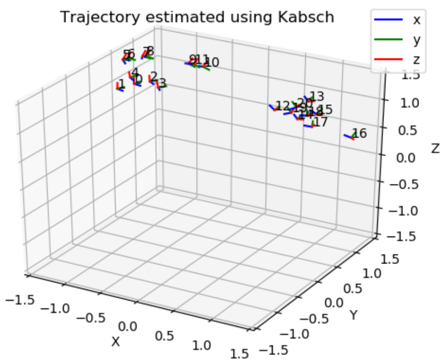
Figure 2: Vision error for various registration techniques with 30 frames skipped



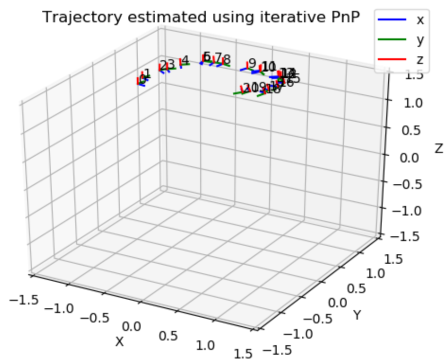
(a) Ground truth from Vicon



(b) Estimated trajectory for Essential Matrix method, start at origin. Note axes scaling x4

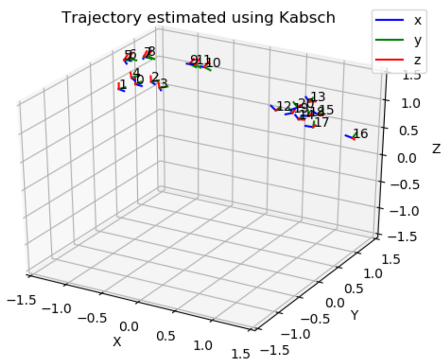


(c) Estimated trajectory for Kabsch method, start at origin. Note axes scaling x2

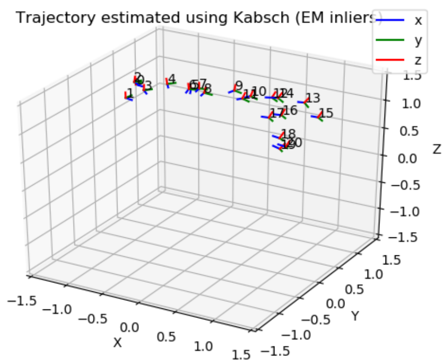


(d) Estimated trajectory for PnP method, start at origin. Note axes scaling x2

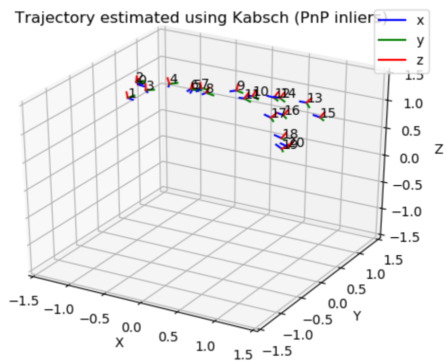
Figure 3: Trajectory visualizations for third quad dataset



(a) RANSAC Kabsch



(b) Kabsch with Essential Matrix inliers



(c) Kabsch with PnP inliers

Figure 4: Trajectory visualizations for third quad dataset, Kabsch method with different inliers