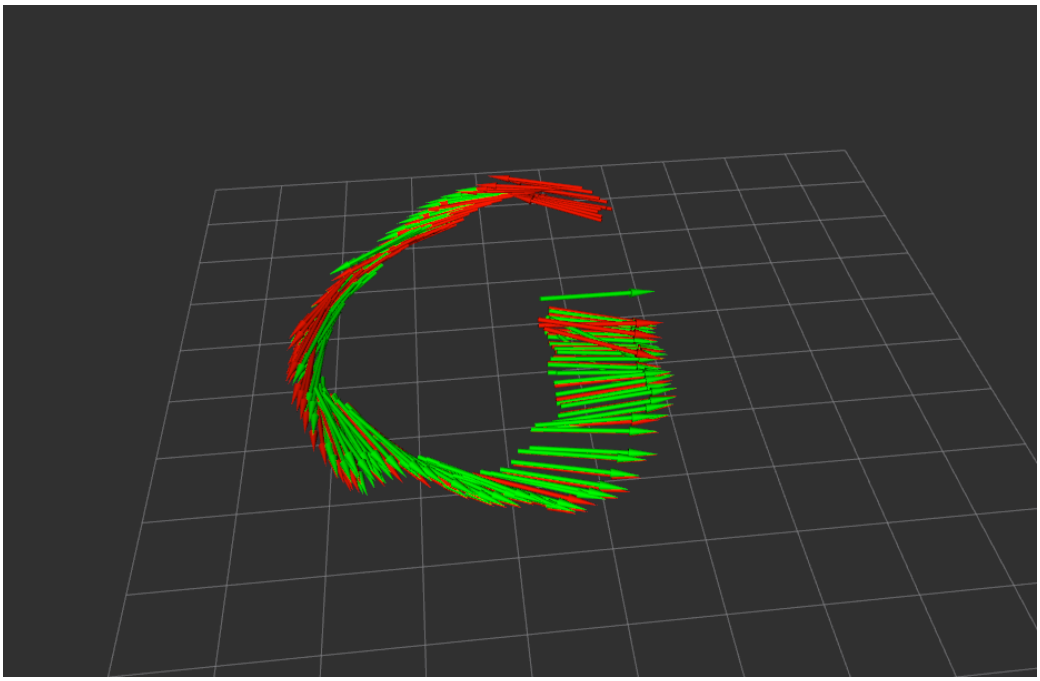
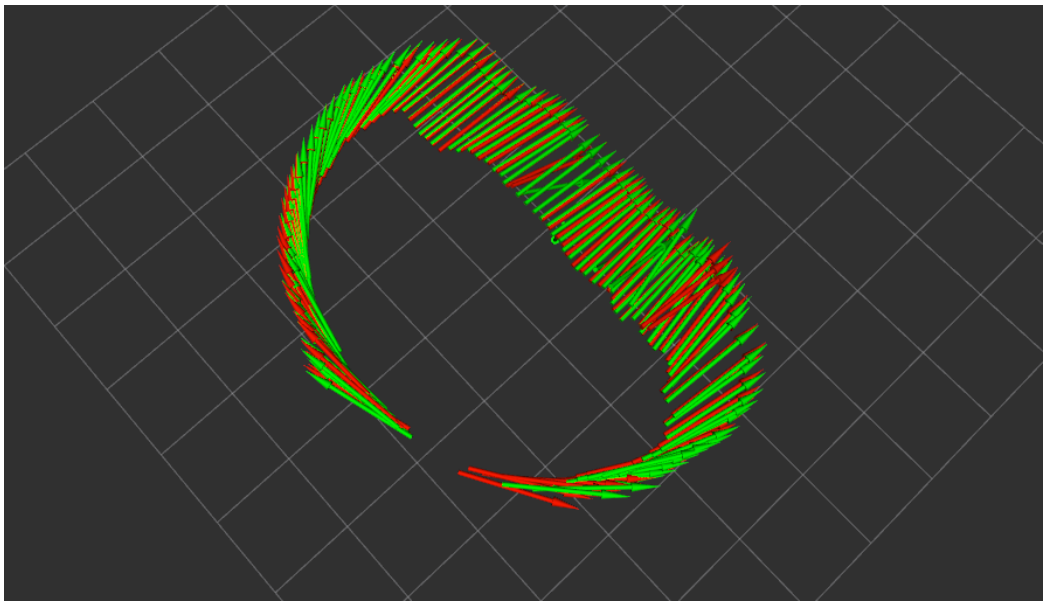
Project 2 Phase 1 Report

FENG Chen

1. Figures (Reference: Red, Estimation: Green)





2. Statistics of the result

Object	RMSE
Rotation	0.0232711
Translation	0.0383763

3. Implementation

Firstly, I equipped the environment with aruco lib under OpenCV3 and ROS Melodic. Secondly, I started to solve this estimation problem. Because homography matrix has 8 DoF, so I have to choose over 4 matched 3D-2D points. I traverse whole vector of points and the number of points are all more than 4 that's reasonable. Then I set A matrix and do a SVD solution to obtain estimated H matrix. Afterwards, according to the formulation of K's inverse matrix multiplying by estimated H matrix, I obtain 2 columns of rotation matrix and unnormalized translation vector. Then I use SVD to get final estimated rotation matrix and translation vector by normalization. However, I found a small problem in given codes. In implementation of obtaining undistorted pixel coordinates, OpenCV api function **cv::undistortPoints** didn't give the intrinsic matrix after undistortion so that the estimation has some problems. I labeled it as annotation in my codes.

4. Something aware

I have saved the config of RVIZ so that you just need to run "roslaunch tag_detector bag_tag.launch" in your terminal and you will see the visual results and RMSE.

I also push this project to my github repo: project2 phase1 repo