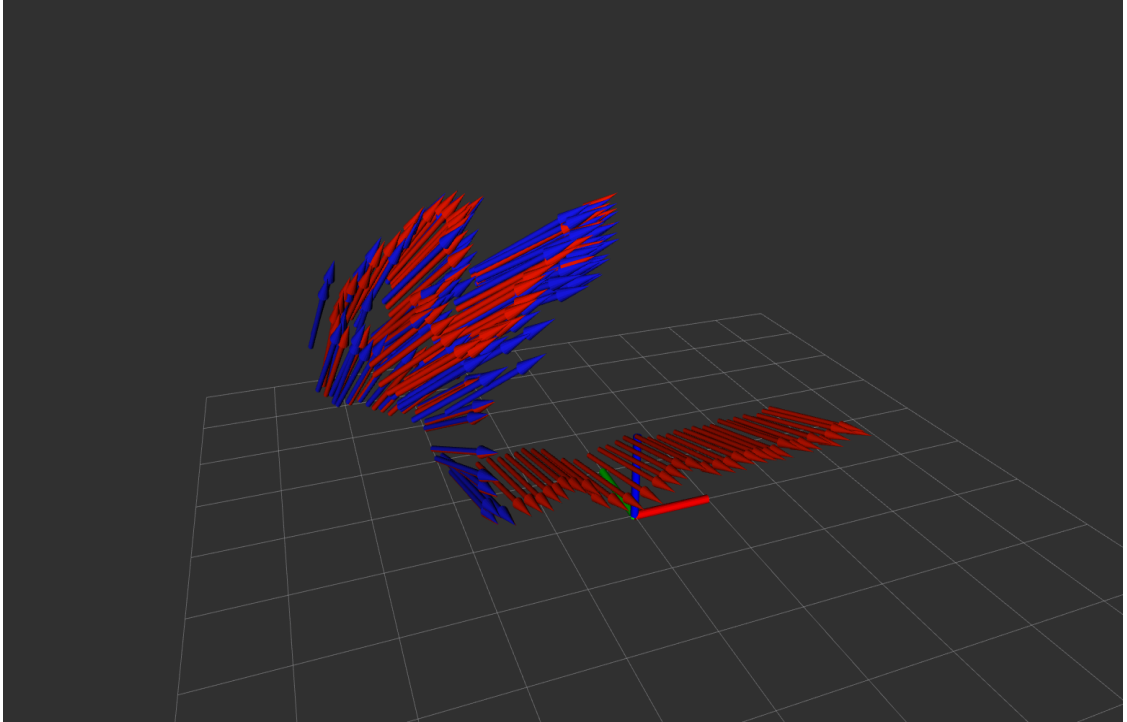


ELEC 5660 Project 2: Phase 1

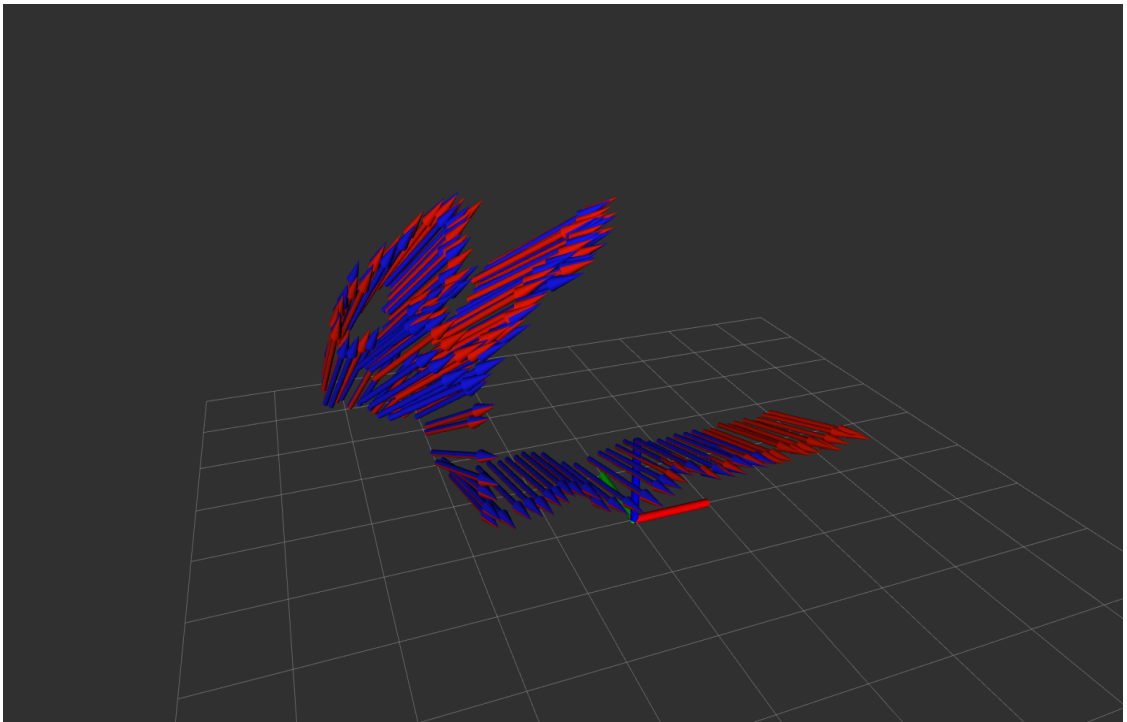
Binqian JIANG

Figures

Sample image (DLT)



Sample image (DLT+BA)



Statistics

The performance is described using *Average Frobenius norm*:

$$\text{error} = \frac{1}{N_{inlie}} \sum \|T_{i,ref} - T_{i,my}\|_F$$
$$T = \begin{bmatrix} R & t \\ 0 & 1 \end{bmatrix}$$

In cases of outlier rej, estimations with delta T's Frobenius Norm > 0.5 are treated as outliers and will not be used to calculate average delta T's F norm. Also note that outlier rejection is applied to counting and has nothing to do with the published data.

Cases	Average Frobenius norm	Inlier count
DLT, all	2.410648	1744/1744
DLT, outlier rej	0.031027	1728/1744
DLT+BA, outlier rej	0.015662	1729/1744

Description

1. The tag positions produced by the AR module all have zero z coordinates. If we use this as a prior information, the 3D-2D PnP problem is reduced to some kind of homography estimation. Complete solution of a real 3D-2D pose estimation problem can be found [here](#).
2. Since the reference visualizes R_{cw} and t_{cw} , I also visualize R_{cw} and t_{cw} for clear comparison, though they are not the direct pose of the camera in the world frame.
3. NL optimization of the pose using BA with analytic Jacobian is used after obtaining an initial guess from DLT method. (Not true BA, as it does not optimize 3D points)

Note

Code files used for BA and the new `CmakeLists.txt` are submitted.