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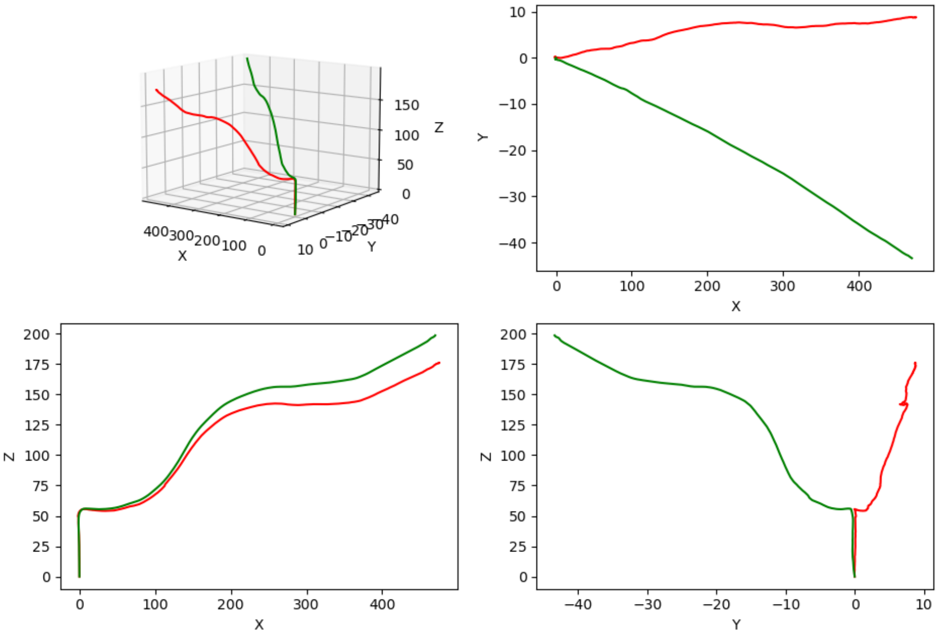
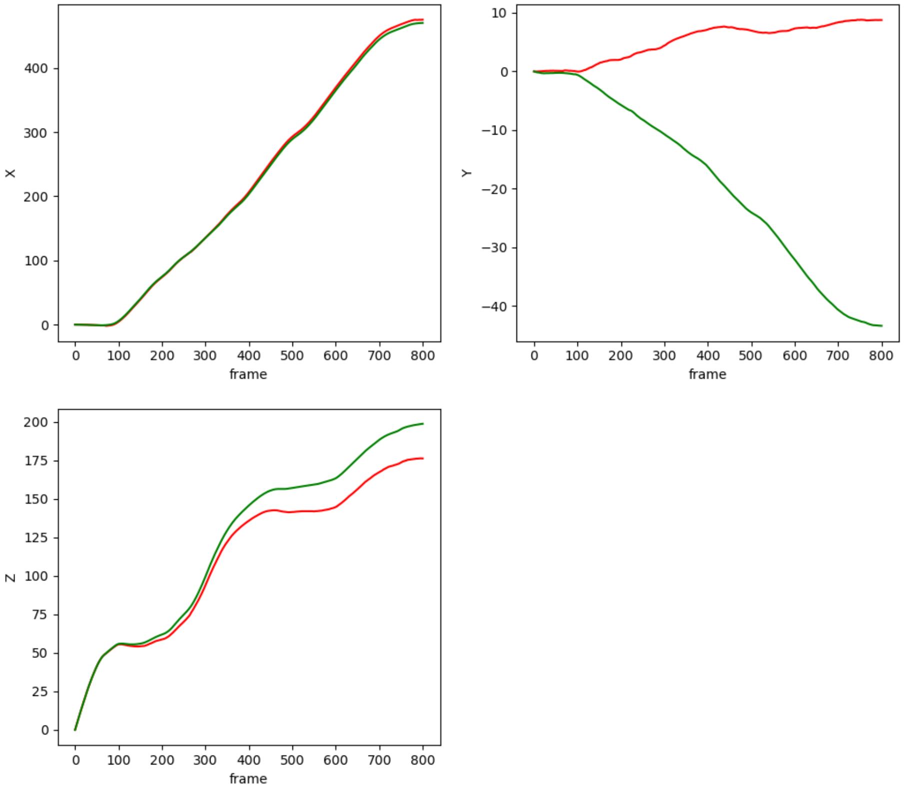
Challenge Update
CS585: Image and Video Computing

My current method and plan for performing this visual odometry task is to implement the entire pipeline using opencv at first, ensuring everything works properly, and then begin to break away from opencv and implement key pieces of this challenge by hand, such as estimating the Essential Matrix and recovering the pose from it. I am attempting to follow the algorithm outline defined in the Wikipedia article we were linked to in the README file, beginning with feature detection. As of this moment, I have incorporated the Oriented FAST and Rotated BRIEF (ORB) feature descriptors due to their efficient computation, performance of feature detection on-par with SIFT and better than SURF, as well as its ease of implementation. I am allowing the detector to find 4,000 different points, of which a minimum of 2,000 must remain for accurate matching to find the essential matrix. To track these features, I utilized the KLT tracker which performs iterative tracking across an image pyramid for more robust matching. Once the locations of the original features are returned in the second image, I plug it into the 'findEssentialMat' function which uses the 5-pt algorithm. Once this is done, I plug the estimated Essential Matrix into 'recoverPose' to get an estimate of the rotation and translation vectors.

In terms of what I need to improve and debug, I am currently having an issue related to the Y-coordinate of my estimates. I am not sure why, but the Y-value seems to be the only one that is misbehaving in terms of estimation. I will be investigating this issue further, as well as beginning to implement portions of the challenge by hand. Below are some plots related to the estimate of the trajectory. The first plot is the raw 3D plot, along with axis vs. axis. The second plot is each axis vs. frame number (time).




X
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100
200
300
400
frame
0
100
200
300
400
500
600
700
800
Y
10
0
−10
−20
−30
−40
frame
0
100
200
300
400
500
600
700
800
Z
0
25
50
75
100
125
150
175
200
frame
0
100
200
300
400
500
600
700
800