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ECEN 631

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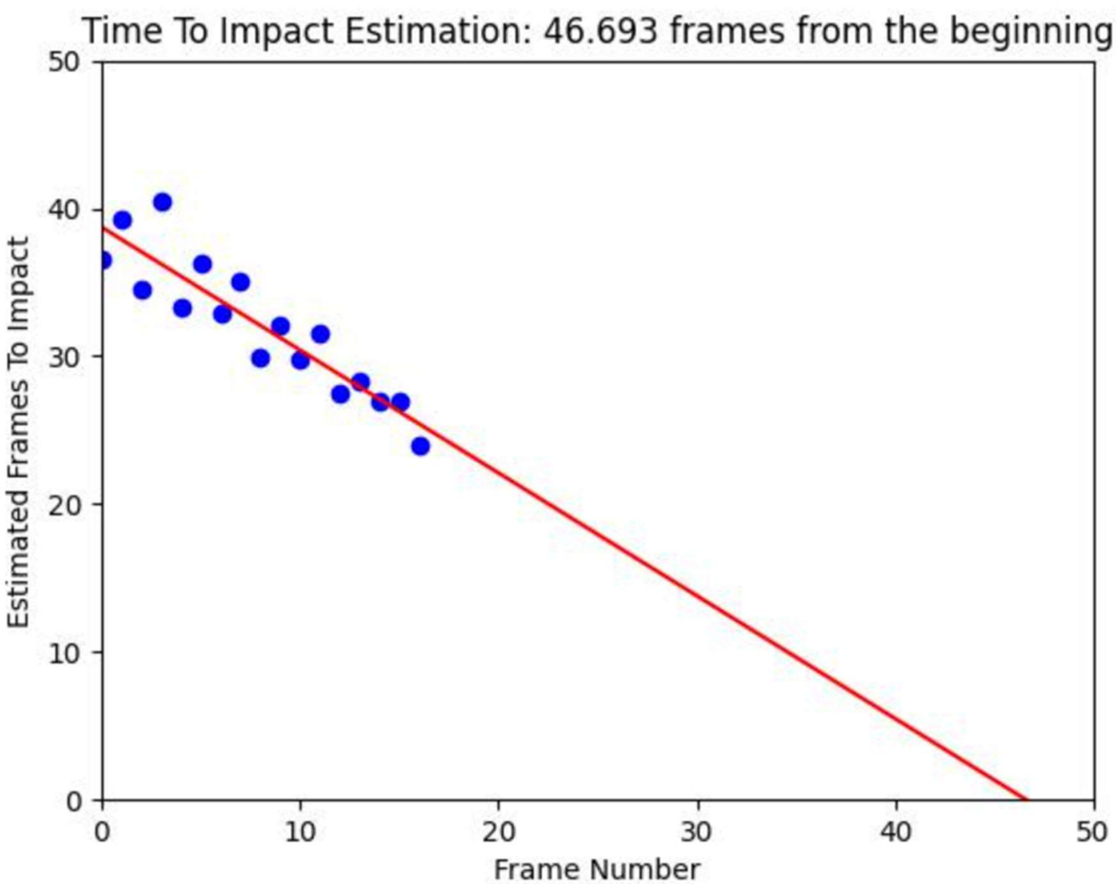
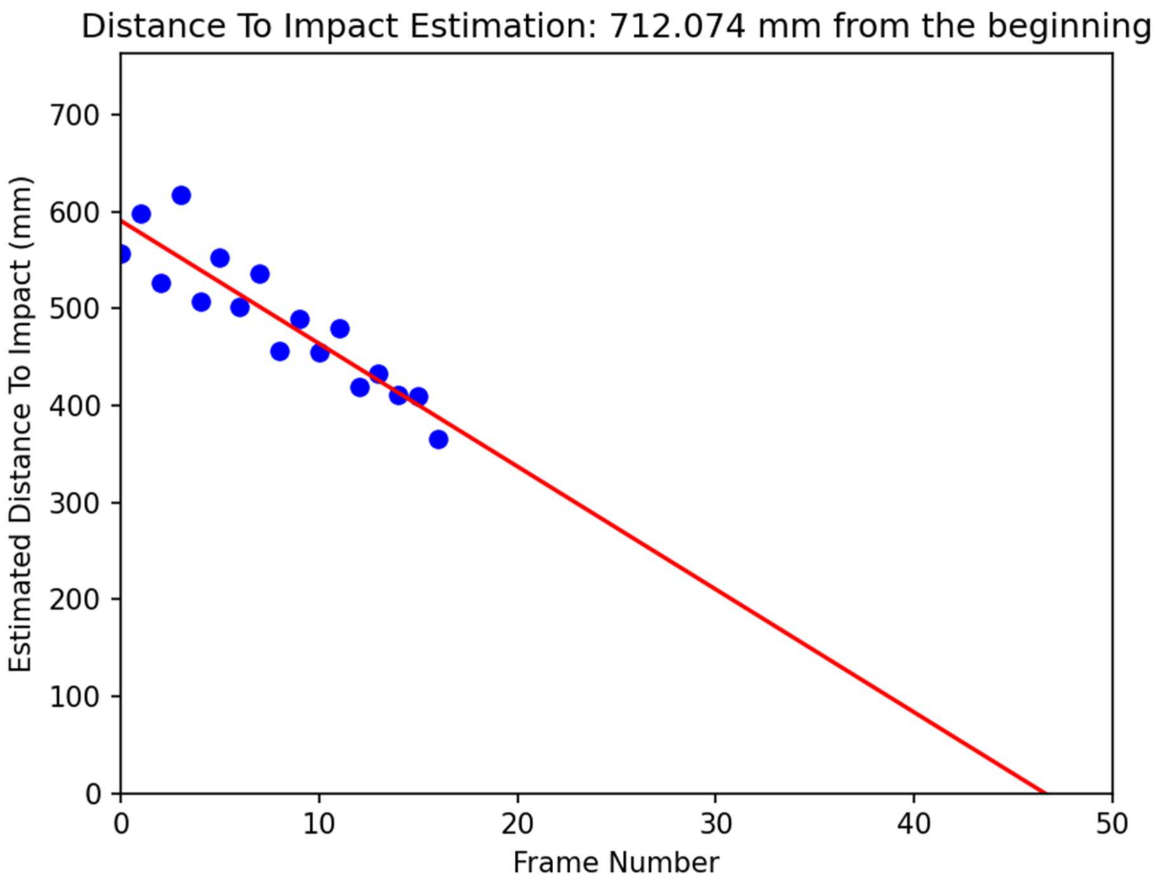
Task 1

For this task, I used SIFT to find features in each frame. I passed in those features into a K-nearest-neighbor matching algorithm to determine which features match from frame to frame. Then, for each matched feature, I calculated the distance to the optical center. Using these distances, I used the formula provided in the slides to find the expansion rate and estimate the time to impact. My results are shown in the plot below. The prediction is that impact will occur in 46.693 frames (from the start).



Task 2

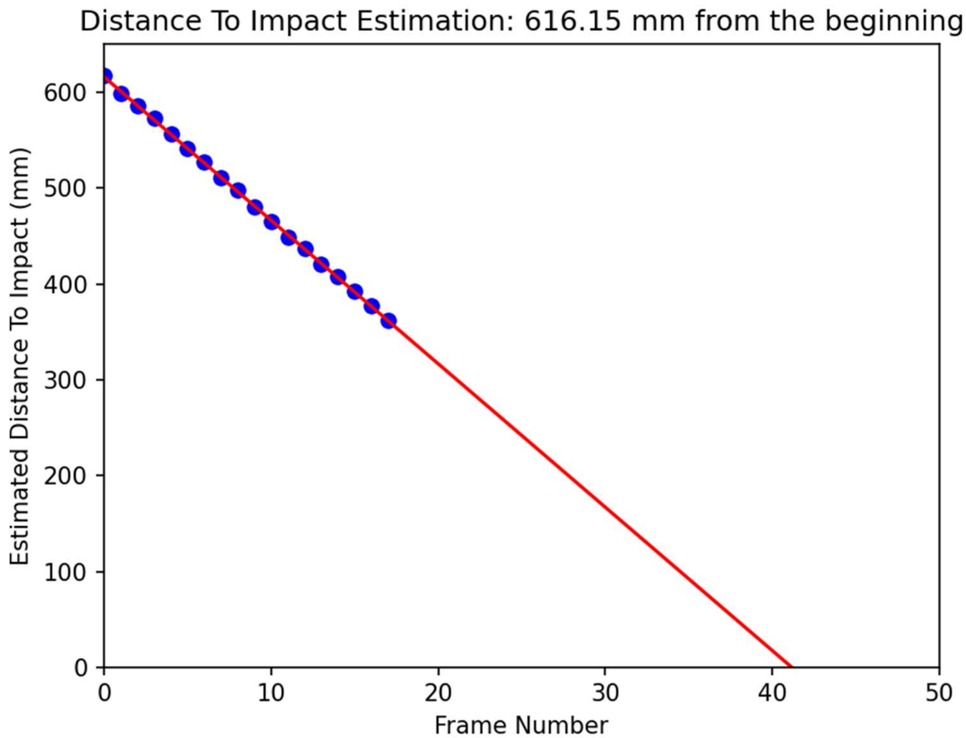
This task was pretty straightforward. We were already given the information that the image sequence was taken at 15.25 mm intervals (moving toward the gas can). So, all I had to due was to multiply the estimated time to impact by 15.25 (to change the units). This led to the prediction that the can started 712mm away from the camera.



Task 3

This task seemed to be the most accurate. Rather than calculating the rate of expansion for the pixels, I constrained the features to that of the gas can. I followed a similar process to that of the homography homework by clipping out the gas can in one of the image and extracting features.

Then, for each frame in the sequence, I only matched features on the gas can. Using these matches, I was able to get a bounding box around the gas can which I then used to find the width in pixels. Then, to find the distance to impact, I took the focal length times the width of the gas can divided by the width of the frame in pixels. This had similar results to the last problem. But it was much less noisy, meaning that it is more likely to be accurate. My plot is shown below.


Distance To Impact Estimation: 616.15 mm from the beginning
Estimated Distance To Impact (mm)
0
100
200
300
400
500
600
0
10
20
30
40
50
Frame Number