ECEn 631 Time to Impact

Objectives:

- Learn to estimate 3D information from focus of expansion
- Learn to compute time to impact.

Instructions:

- Download the Time to Impact image sequence (18 frames) from BYU Learning Suite.
- The image sequence was taken at 15.25 mm intervals (moving toward the gas can).
- Download the camera intrinsic and distortion parameters (TTI Camera Parameters.txt) from BYU Learning Suite.
- The gas can diameter (width) is 59 mm or 2 and 11/16 inches.
- Convert each frame to 8-bit single channel using cvtConvert() with the CV_RGB2GRAY flag before processing.
- Undistortion() of the images before processing is not necessary.
- Include your result, images, and discussion for all three tasks in one PDF file.
- Submit your PDF file and source code file(s) in one zip file without the folder or directory.
- Use your first name and last name (e.g., justinsmith.zip) as the file name.
- Login to myBYU and submit your work through BYU Learning Suite online submission.

Task 1: Unknown Object Velocity and Object Size 40 points

- Write a program to detect features and process or track these features from frame to frame to calculate the rate of expansion to determine the time to impact in terms of number of frames. You should NOT select feature points manually.
- Use a graph to explain how you estimate the time to impact.

a

tau = a/(a-1)

Task 2: Known Object Velocity 30 points

- Calculate the distance to impact in terms of distance in mm. Explain and show your work in your PDF file.
- Plot a graph that shows the object distance for each frame (distance vs. frame number).

Task 3: Known Object Size and Camera Parameters 30 points

- Calculate the object distance for each frame (with known object size and camera parameters). Explain and show your work in your PDF file.
- Plot a graph that shows the object distance for each frame (distance vs. frame number).