

## 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 `cvtColor()` with the `CV_RGB2GRAY` flag before processing.
- `Undistort()` of the images before processing is not necessary.
- You will lose 20 points if any of the following requirements is not met:
  - 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 these features 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.

### Task 2: Known Object Velocity 40 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).