Project: Track an Object in 3D Space

Submission Results

Submission Date: September 20, 2019

✓ Submission Passed

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Feedback Details

Specification Review   Code Review

Reviewer Note

Greetings Student, This was a brilliant submission and I enjoyed reviewing your work. By carefully going through the project, it shows a lot of effort, diligence and above all, understanding of the project. I hope you had a great moment implementing this project and I wish you all the best.👏

FP.0 Final Report

✓   Provide a Writeup / README that includes all the rubric points and how you addressed each one. You can submit your writeup as markdown or pdf.

> **Reviewer Note**
> Great job!!
> The writeup includes a statement and supporting images that explain how each rubric item was addressed, and specifically wherein the code each step was handled.
>
> The writeup / README should include a statement and supporting figures / images that explain how each rubric item was addressed, and specifically where in the code each step was handled.

FP.1 Match 3D Objects

✓   Implement the method "matchBoundingBoxes", which takes as input both the previous and the current data frames and provides as output the ids of the matched regions of interest (i.e. the boxID property). Matches must be the ones with the highest number of keypoint correspondences.

> **Reviewer Note**
> Awesome!! We can clearly see that your code is functional and returns the specified output, where each bounding box is assigned the match candidate with the highest number of occurrences.
>
> Code is functional and returns the specified output, where each bounding box is assigned the match candidate with the highest number of occurrences.

FP.2 Compute Lidar-based TTC

✓   Compute the time-to-collision in second for all matched 3D objects using only Lidar measurements from the matched bounding boxes between current and previous frame.

> **Reviewer Note**
> Nice job! The code is functional and returns the specified output. Moreover, it is able to deal with outlier Lidar points in a statistically robust way to avoid severe estimation errors.
>
> Code is functional and returns the specified output. Also, the code is able to deal with outlier Lidar points in a statistically robust way to avoid severe estimation errors.

FP.3 Associate Keypoint Correspondences with Bounding Boxes

✓   Prepare the TTC computation based on camera measurements by associating keypoint correspondences to the bounding boxes which enclose them. All matches which satisfy this condition must be added to a vector in the respective bounding box.

> **Reviewer Note**
> The code performs as required and adds the keypoint correspondences to the "kptMatches" property of the respective bounding boxes. Furthermore, outlier matches have been removed based on the euclidean distance between them in relation to all the matches in the bounding box.
>
> Code performs as described and adds the keypoint correspondences to the "kptMatches" property of the respective bounding boxes. Also, outlier matches have been removed based on the

FP.4 Compute Camera-based TTC

✓ Compute the time-to-collision in second for all matched 3D objects using only keypoint correspondences from the matched bounding boxes between current and previous frame. ⌃

Reviewer Note

Well done here!! The code is able to deal with outlier correspondences in a statistically robust way to avoid severe estimation errors. 👍

Code is functional and returns the specified output. Also, the code is able to deal with outlier correspondences in a statistically robust way to avoid severe estimation errors.

FP.5 Performance Evaluation 1

✓ Find examples where the TTC estimate of the Lidar sensor does not seem plausible. Describe your observations and provide a sound argumentation why you think this happened. ⌃

Reviewer Note

Good job on this one!! Several examples have been identified and described in detail.

Several examples (2-3) have been identified and described in detail. The assertion that the TTC is off has been based on manually estimating the distance to the rear of the preceding vehicle from a top view perspective of the Lidar points.

FP.6 Performance Evaluation 2

✓ Run several detector / descriptor combinations and look at the differences in TTC estimation. Find out which methods perform best and also include several examples where camera-based TTC estimation is way off. As with Lidar, describe your observations again and also look into potential reasons.

Reviewer Note

Great implementation. Keep it up!

All detector / descriptor combinations implemented in previous chapters have been compared with regard to the TTC estimate on a frame-by-frame basis. To facilitate comparison, a spreadsheet and graph should be used to represent the different TTCs.