FP.5 : Performance Evaluation 1

TTC Lidar

The TTC Lidar calculation between fame 7 and frame 8 seems way off, because from 13.869s between frames 6 and 7 it jumped to 34.3548s. This is not consistent with the TTC between most of the frames given that it didn't look like there was any sudden big changes in the distance as a result of increase in velocity between the two vehicles. Also, at the same interval TTC Camera did not show similar result.

A similar result was obtained between frame 8 and frame 9, was down to 17.4767s from 34.3548s, which is also abnormal compared to other TTC results between other frames.

- **Factors that could cause the inaccurate lidar measurements**

First, it looks like a few image frames have been misplaced by mistake or intentionally. But other causes of such abnormal result could be listed as follows:

Signal noise: Different elements, such as mechanical vibrations, temperature changes, electrical interference from other sources, and others, might contribute to this and degrade the accuracy of lidar readings by interfering with the detection of the returning laser pulse.

Environmental conditions: Atmospheric factors like temperature, humidity, and the presence of dust or other airborne particles can have an impact on lidar data. These variables may influence the power of the returning laser pulse and the speed at which the laser travels, which may have an effect on the measurement accuracy.

System calibration: The calibration of the equipment affects how accurate lidar measurements are. The measurements could be off if the system is not correctly calibrated. To make sure the system is operating properly, it must be calibrated frequently.

Other factors include Range resolution, Scan rate, and Object reflectivity.

FP.6 : Performance Evaluation 2

TTC Camera

After running the different detector / descriptor combinations and looking at the differences in TTC estimation, I would say the detector / descriptor combinations of FAST / ORB using the FLANN approach is the best compared to the others, followed by SHITOMASI / ORB(BF) and SHITOMASI / BRIEF(BF). This is because these combinations look more consistent when one observes the image frames with the necked eyes, except for a couple of places where abnormal results were recorded.

For instance, TTC camera between frame 6 and frame 7 for the FAST / ORB combination is very strange. It jumped from 13.7991 between frames 5 and 6 to 83.3166 between frames 6 and 7. And it falls back to 12.842 between frames 7 and 8. Frome my observation of the image frames with the eyes, such fast movements between the cars cannot be observed. And that makes me think that there could have been some misplacement of a couple image frames. Else I have listed some other things that could explain the abnormal results.

- **Factors that could cause the inaccurate camera measurements**

Environmental conditions: Like with lidar, camera measurements can be affected by atmospheric conditions such as temperature, shadows, humidity, and the presence of dust or other particles in the air. These factors can affect the light intensity, introduce noise, etc which can impact the accuracy of the measurements.

System calibration: This could also be another factor. If the system is not properly calibrated, the measurements may be inaccurate. It is important to regularly calibrate the system to ensure that it is functioning correctly.

In conclusion, to guarantee that the readings are as accurate as possible, it is crucial to take these parameters into account when employing both lidar and camera technologies. It is possible to obtain high-quality lidar and camera data that can be used for a variety of applications by being aware of these aspects and taking action to lessen their effects.

References:

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3. https://github.com/pfrapp/sfnd-camera-final