3D LIDAR Point Cloud based Intersection Recognition for Autonomous Driving

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Overview

In this paper we can get to know about a highly accurate method used to find Road Intersections like T-shaped and + Shaped intersections using 64-beam scanning LIDAR mounted on the roof of our vehicle.

Goals

1. To get to know the road intersections using LIDAR , AI and ML
2. To get high accuracy in road intersection detection in real time.

Why we need a new algorithm :

Many existing systems such as GPS , INS , GIS are used in many places but they are often less accurate and not even updated in many , so obviously they are not good for autonomous vehicles.

Working principle:

Our model has a 64-beam scanning LIDAR mounted on the roof of our vehicle , which can be used to get an accurate 3D-image of our environment.Here we consider intersection detection as a classification problem. The classification problem is based on the distance between the road curves/ends and us .

Here is quick summary of what we going to do :

1) First obtain the 3-D image.
2) Then find trees mostly in the corner of the road.
3) Then we should remove the pedestrians and cars from the grid map we obtained , we will see how to do it.
4) Then plot a graph between angle vs distance between us and road's corners or curves.
5) Then make a 360-D vector (one distance per degree) and it can be considered as a classification problem
6) We need the data into SVM classifier and obtain results.

How to remove pedestrians :

- Create a grid map
- Each frame with quadratic cells like r x r

- Find the variance of elevation and then we use the threshold on it .
- Based on the Variance of elevation and threshold we can get the difference the cell with pedestrians and free cells.
- Then we can clear the cells with pedestrians

Results :

- In low pedestrians and cars density region the accuracy is upto 94% and TNR , TPR value are above 90%
- But in high density regions , The accuracy is less than 85% but not below than 80% which is reasonably good value.
- Mainly these are calculated in real time using an intel duo core 2.3 Ghz processor.
- It has high accuracy in telling whether a road has intersection or not than the whether it is T or + junction.