Vehicle Localization & Tracking for Collision Avoidance Systems

Background

Tracking and localization of traffic participants is an important area of research for autonomous vehicle applications. Can the vehicle detect cars, trucks and human pedestrians on time? Using such detection the trajectory planner decides a safe trajectory to be executed. Consider the case of pedestrian detection shown below:

The objective is to identify human position, orientation, velocity and adapt the trajectory planner to avoid collision [1]. But, the human information is not generally available in real time due to lack of sensors, bad weather conditions etc. In such cases design of real time estimators to detect position, velocity etc. of traffic participants can prevent accidents. Open questions on environmental disturbances, uncertain parameters, rapid dynamics of participants while designing such estimators among others remain to be solved. Such issues will be addressed in this thesis for real time traffic participant estimation based on set based estimators. Set-based concepts are highly popular for real time applications to path planning, verification of driving manoeuvres, robotics etc [2].

Description

In this thesis, the aim is to find the position and orientation of vehicles/obstacle in the path of an ego vehicle. Set-based estimators (SBE) would be developed and tested for various scenarios. Specifically the main tasks of this thesis are:

- Literature review of set-based estimators and localization models for familiarization.
- Estimator design of various tracking based models such as constant acceleration, constant velocity, turn rate etc [3].
- Validation of estimators on real traffic data for various scenarios involving multiple traffic participants. Comparative assessment with Kalman filters and other tracking estimators.

For those interested in automated vehicles, traffic participant modelling and localization and tracking, this thesis provides a great opportunity.

References