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Project Summary

Detection and classification using data from an automotive laser range-finder

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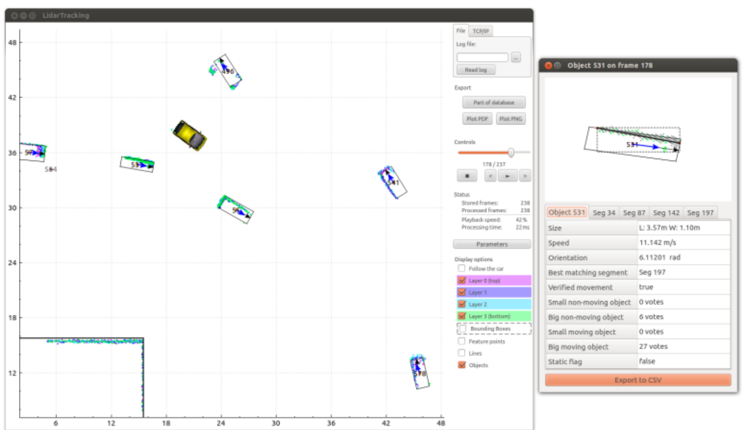

Figure 1:Object tracking software

Laser range-finders are commonly used on intelligent vehicles for the observation of the surroundings. The detection and tracking of moving objects (DATMO), including classification, provides crucial data for advanced features such as collision prediction or trajectory planning systems in road environments.

This project develops a tool capable of detecting, tracking and classifying objects using range data obtained from automotive laser range-finders. The software tool works in real time, with simulated and real world range data.

The range data is obtained from a Citroën C-zero electric car equipped with an Applanix positioning system and four IBEO Lux lidars. This setup is faithfully reproduced in a virtual environment using Webots, a realistic robot simulator. In the simulator, specific road environments and scenarios are designed, allowing testing of the software without the need to collect data using the real car.

The detection, tracking and classification algorithms are written in C++ using the Qt framework, the plotting library QCustomPlot and the Eigen linear algebra library, allowing the software to be cross-platform. The data is obtained through a TCP/IP network socket from either Webots, in the case of simulated data, or from a ROS node in the case of real data. Using this network connection, live data can be processed. The data acquired through TCP/IP can then be saved to log files and accessed later in time.

The developed system proved to work reasonably well with simulated data. In a test scenario involving a hidden pedestrian crossing the road, the system was able to predict its trajectory from a few previous measurements, underlining the potential uses of such a system as a safety feature in future cars. It also highlighted the big difference existing between simulation and reality, as the results obtained with real world data show some important differences. The limits of the current object tracking approach were quickly demonstrated by the difficulties encountered with complicated shapes observed in reality. While there is room for improvement, the software in its current state can already be used for work in simulation.