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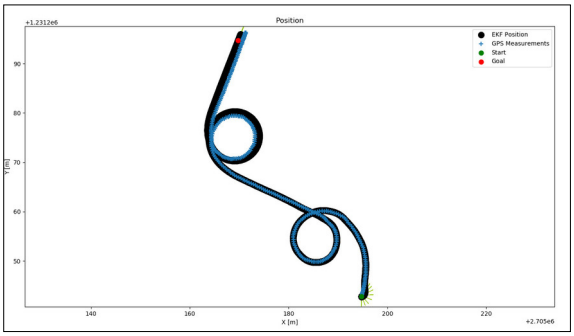
Position, Velocity and Time Logger

For the ICOM Wireless Research Vehicle

Opel Ampera-e 2017 - The ICOM Wireless Research Vehicle
Own presentment

Introduction: Due to the growth of different wireless communication-systems measuring in the field is expected to take a higher importance in the future. With the help of the wireless research vehicle the ICOM is able to do coverage measurements and create so-called coverage maps for industrial partners. To take up such measurements it is important to know the exact position of the vehicle. The goal of the project is to develop a logger for the vehicle which estimates the position, orientation and speed of the vehicle.

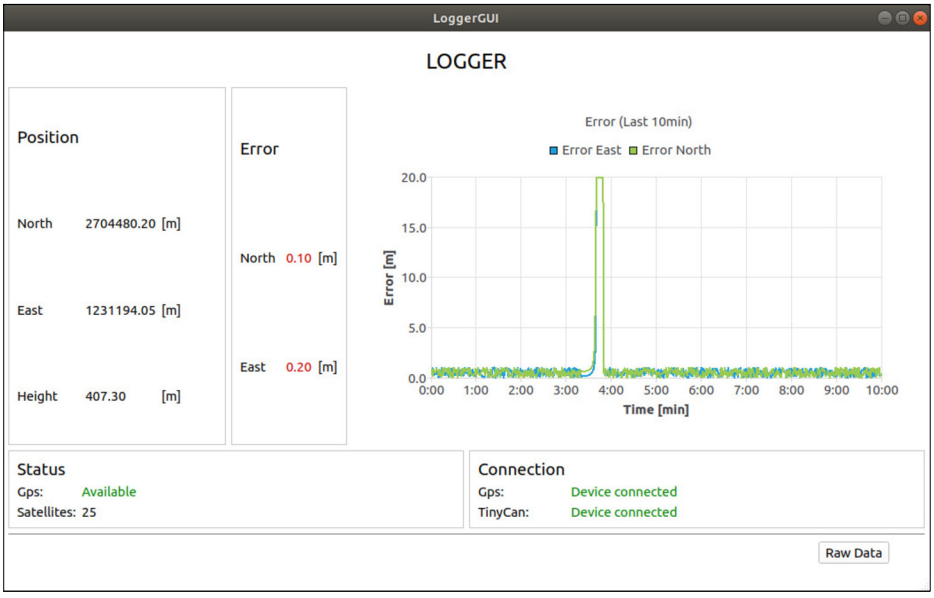
Approach: In an open space, the position can be located with GNSS signals and therefore it is an accurate estimation. When no GNSS signals are available, it will be difficult to pinpoint the exact position of the vehicle, therefore another approach is needed. The future position can be predicted with a car model called Constant Turn Rate and Velocity which is based on the single track model. Then an extended Kalman filter is used to correct the estimation. A CAN-USB adapter delivers parameters like speed and steering angle of the car over the On-Board-Diagnosis interface.



Simulation of the Kalman filter with GPS loss in the middle and driving with slow pace
Own presentment

Result: The main part of this project is the logger which collects the data, estimates the position and logs all parameters. Additionally, a GUI displays the current position and the error with a real time chart. In the GUI it is possible to extract specifically wanted data from previous log files.

Simulations of the extended Kalman filter have shown that the position estimation is very accurate while GNSS data is available. Without this data the accuracy depends highly on the speed of the car. For driving in slow pace the mean error is about 1m and for high velocities the mean error can grow up to a significant level.



Graphical user interface of the logger application
Own presentment