Ágota Benyhe
MASTER THESIS ABSTRACT

Peer vehicle lane change estimation with machine learning technique

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Nowadays the Automated Driving and Driver Assistance Systems are increasingly spreading. In order to decrease the number of accidents caused by lane changing, developing safety-oriented Driver Assistance Systems is essential. This thesis is intended to estimate the motion of the peer vehicles, more precisely lane change prediction.

The main purpose of this thesis is to establish a machine learning based model that can warn the driver potential lane changes with high reliability level. First, the mathematical background of some typical classification method is introduced. Exploring this, requires applying different mathematical fields.

The research area is prediction lane change based on multivariable time series. The time series is unstationary and it even with differentiation can not be transformed into a stationary one. The result of the problem is highly influenced by the observed time. It is a key point to specify a time window in order to get a proper result and even to ensure the real time prediction.

First logistic regression and Support Vector Machine classification method, available in Matlab, were experimentalized and their performance was tested on concrete data. These methods separately proved not to be reliable enough. Therefore a method is worked out, that is first based on an unsupervised learning algorithm, Principal Component Analysis, thus the dimension are can be decreased. With the result of this method the Support Vector Machine can be trained based on Gaussian kernel. The properly adjustment of parameters was also a problem.

The result of this method seemed to be much more reliable:

$$\begin{aligned} \text{Precision} &= 0.82 \\ \text{Recall} &= 0.88 \\ \text{F1-score} &= 0.83 \\ \text{Misclassification rate} &= 0.17 \end{aligned}$$