

## Master's Thesis

# Improved Emergency Lane Creation Using V2V Communication

## Abstract

The creation of an Emergency Lane (EL) has received a lot of media attention in recent years. Many accidents have been reported in which Emergency Vehicles (EVs) only reached the scene of the accident with effort and loss of time. Even though creating the EL is mandatory for all traffic, many issues exist: Drivers do not react immediately, they do not make room for EVs, or wait in front of red light instead of carefully crossing the stop line. Hectic and wrong reactions and resulting driving decisions are dangerous for other traffic as well as the EVs.



Vehicle to vehicle (V2V) communication offers the possibility to inform other vehicles about the arrival of EVs in time and thus to form a EL promptly. Communication can also be used to provide vehicles with further information about the operation. Once created, ELs can thus stay intact for multiple EVs that follow with short delays.

## Content

The purpose of this thesis is to quantitatively investigate the use of V2V communication for creation and maintenance of ELs and its impact on the EVs. This is done by simulation studies with Veins<sup>1</sup> and SUMO<sup>2</sup>.

Possible milestones are as follows:

- Literature research on legal requirements for EVs and human drivers in corresponding situations (in Germany).
- Literature research on proposed solutions for using V2V to improve emergency lane creation and maintenance.
- Optional design of new/extended protocols for using V2V to improve emergency lane creation and maintenance.
- Implementation of existing and proposed protocols in Veins and SUMO (C++).
- Evaluation of existing and proposed protocol in simulation studies with Veins.

## Collaboration

This thesis is in collaboration with TU-Dresden / Paderborn University and co-advised by Tobias Hardes<sup>3</sup>.

## Requirements

Interests should have at least some basic knowledge of V2V communication and C++. Knowledge of Veins, SUMO, and OMNeT++ including Discrete Event Simulation (DES) will help as the work will mostly be done with these tools. General skills in literature research are expected as this is one key aspect of this thesis. In case you are not familiar with these requirements, you will need to familiarize yourself during the thesis.

<sup>1</sup><https://veins.car2x.org/>

<sup>2</sup><https://sumo.dlr.de/>

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