

COOPERATIVE INTERACTION STRATEGIES BETWEEN AUTOMATED VEHICLES AND MIXED MOTORIZED TRAFFIC



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Abstract

The aim of this project is to investigate how human drivers interact and communicate in complex urban situations. Based on the investigation, this project will design and test cooperative interactive strategies between AVs and mixed motorized traffic using driving simulation experiments.

Background

Due to the fact that many human road users share the same space, the traffic is regarded a complex social system. Although most of the interactions are governed by a traffic law, there are some situations (as shown in figure 1 a & b) for which rules are not clearly defined.

Human drivers use explicit or implicit ways to communicate their intentions in these situations (Imbsweiler et al., 2018). However, the introduction of automated vehicles (AVs) in a mixed traffic will result in even more challenging situations. Since, situations that require communication and

negotiation could cause trouble for automated systems (Metz, 2018). One approach is that AVs, should imitate communication style of human drivers, so that they will not have to learn new communication signals (Juhlin, 1999). Therefore, the understanding of human communication and negotiation in these situation is necessary.

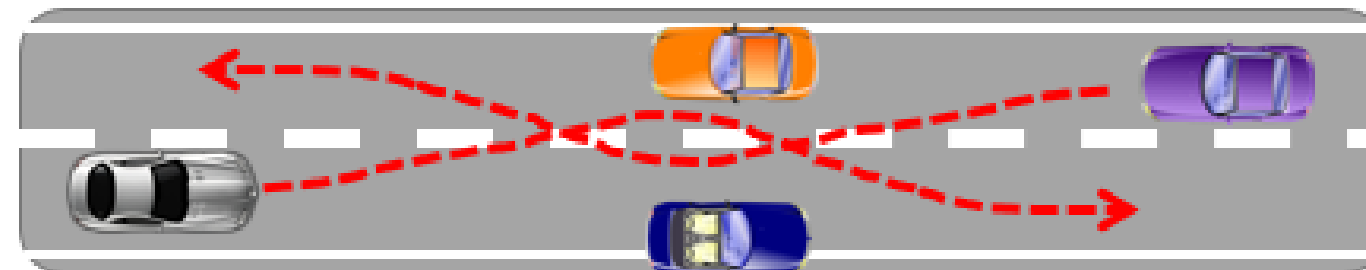


Fig 1a) Equal Narrow Passage

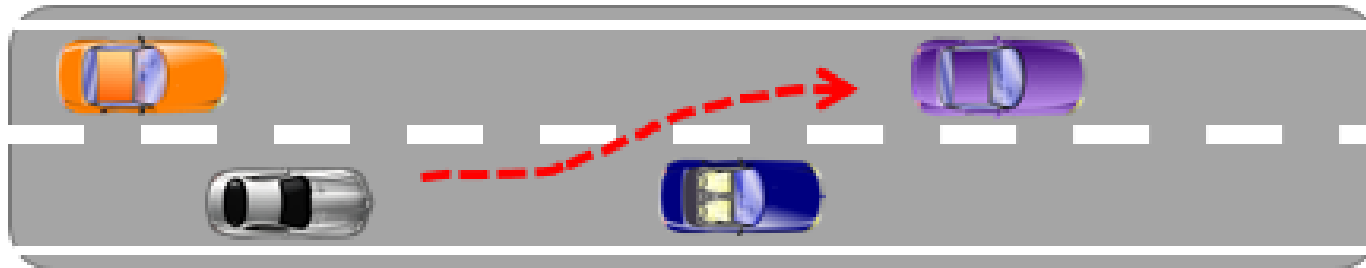


Fig 1b) Cut - In situation

Objectives

- Understand cooperative interactions strategies of human drivers in complex traffic situations using naturalistic driving data.
- Develop and test models of cooperative interactions for automated vehicles.
- Test cooperation patterns using state of the art driving simulator experiments.

- Formulate recommendations for safe, efficient, and cooperative AV behavior in mixed urban traffic.

Study 1: Analysis of Narrow Passage Interactions (In progress)

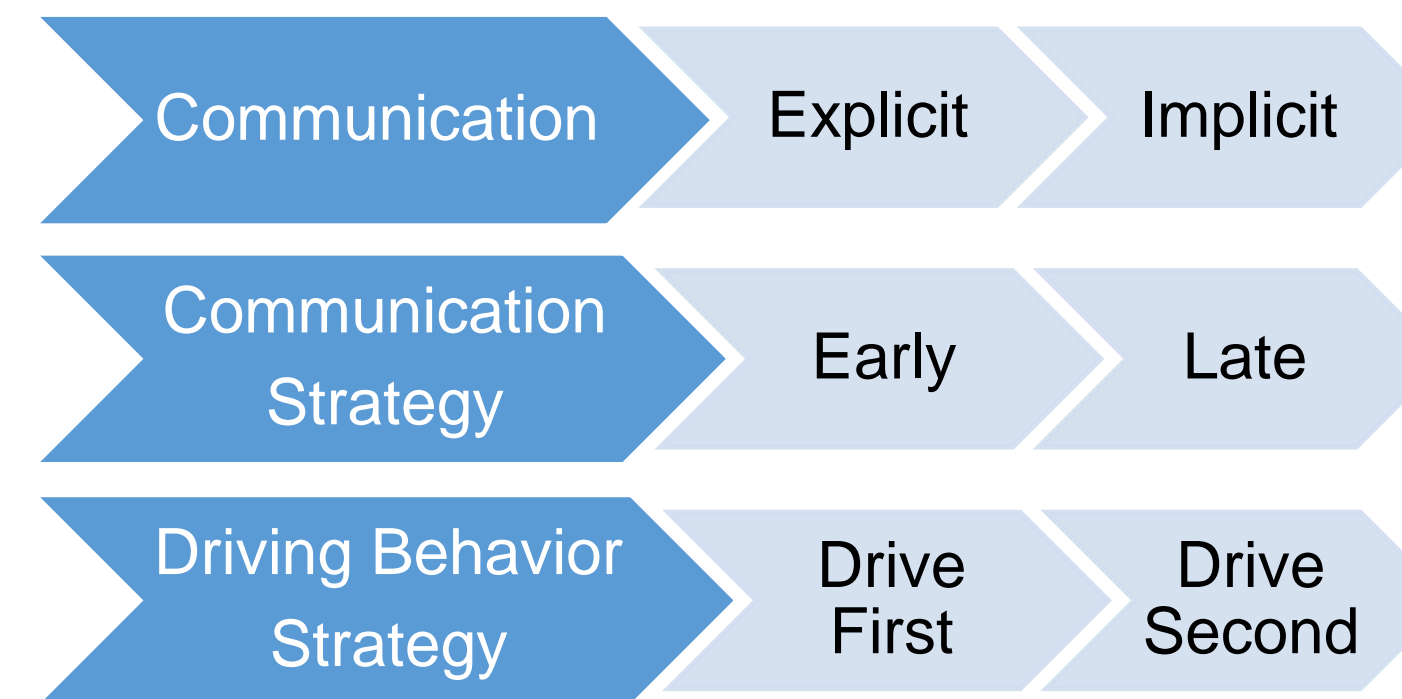


Fig 2) Study 1 research questions

Method & Data

A data collection vehicle was equipped with two cameras, a LIDAR sensor and an Inertial Measurement Unit (IMU). Data was collected in two German cities; Ulm and Neu-Ulm. The data includes around 80 hours of video data, LIDAR detections and self movement data of the ego vehicle. In order to collect speed and position data of oncoming vehicles we are developing a custom tool based on computer vision techniques.

Future Outlook

After the completion of study one, the next phase of my research will involve analysis of driving behavior during cut-in situations.

Supervision and Contact

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