Literature Review on Lane Choice and Lane Change Models in Traffic Networks

Bachelor‘s Thesis of Filip Andrei Cotrut

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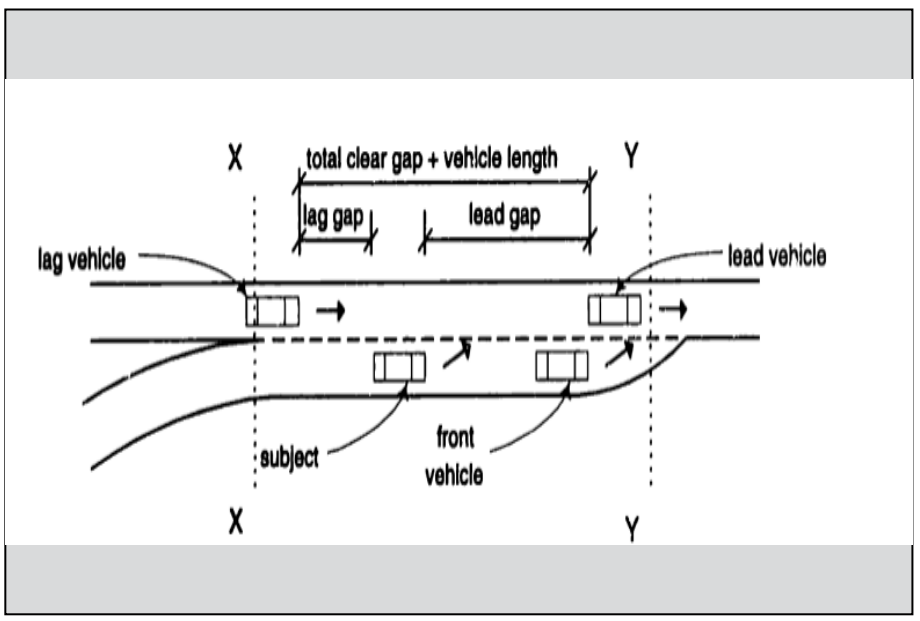
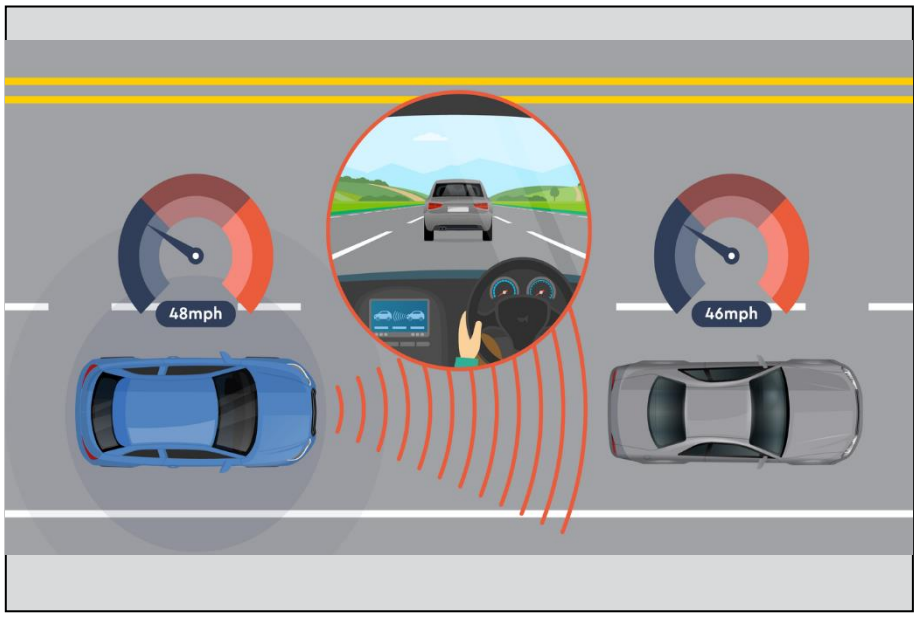


This thesis aims to review various studies on lane change maneuvers, focusing on microscopic simulations, human experiments, and automated vehicles. In conclusion, a new approach for lane-changing behavior in automated vehicles based on the findings discussed throughout the thesis will be proposed.

Human behavior experiments are essential for understanding both physical and behavioral parameters associated with lane changes. These include parameters such as speed, acceleration, gap acceptance, and braking patterns, as well as behavioral aspects like decision-making processes and responses to surrounding vehicles and objects. Such experiments not only provide empirical data to develop realistic traffic models but also serve as a benchmark for validating the accuracy of microscopic simulators and the effectiveness of control algorithms for automated vehicles.

Microscopic traffic simulators are sophisticated algorithms designed to replicate real-world traffic scenarios at an individual vehicle level. These tools allow researchers and engineers to simulate complex interactions between vehicles, including lane changes, in controlled environments. They are indispensable for traffic management applications, enabling the optimization of road networks, and for designing and testing control strategies for automated vehicles in a safe and efficient manner.



Urban	**Freeway**
Low velocity	High velocity
Inconsistent acceleration	Consistent acceleration
Unpredictable braking patterns	Predictable braking patterns
Congested traffic	Lower traffic density
Shorter gaps between vehicles	Larger gaps
More mandatory lane changes	Less mandatory lane changes

Control strategies for automated vehicles build on the insights gained from both human behavior experiments and microscopic simulators. By integrating empirical data and simulation results, these strategies aim to create intelligent systems capable of performing lane changes safely and seamlessly. Such systems must account for human drivers’ unpredictable behavior while maintaining smooth traffic flow and avoiding accidents. The development and validation of these control strategies rely heavily on a combined approach, where human behavior data and simulation models inform and refine automated vehicle algorithms.