Lehrstuhl für Fahrzeugtechnik
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Technische Universität München

MA

Transformer-Based Motion Prediction for Real-World Autonomous Driving Applications

Motion prediction algorithms extrapolate the movement pattern of agents such as pedestrians and vehicles into the future, under consideration of different constraints (map, agent interaction, ..). Thereby, prediction algorithms are often designed with accurate and complete motion histories as input. This means, that the prediction algorithm expects a perfect history of 1-2 s for every agent, to generate accurate predictions. In real-world, such a perfect motion history is not always available, as the upstream detection and tracking modules propagate errors to the downstream prediction. We therefore observe reduced prediction performance when using real, incomplete data as input.

This thesis should address this limitation by replacing traditional “hard” point-mass history inputs with “soft” affinities. Affinities capture the similarity or "closeness" between agents and are computed in the tracking module. Previous research has demonstrated the potential of using affinity for prediction, but their real-world effectiveness is insufficiently studied.

The project is split into five milestones: Firstly a comprehensive literature review on motion prediction and secondly the setup of a development environment should be carried out. Thirdly, the prediction algorithm must be designed and implemented. Fourthly, an in-depth evaluation and comparison to state-of-the-art models should be carried out. Lastly, the model should be improved iteratively.

Work packages:

- Literature review: motion prediction.
- Development environment setup.
- Design and implementation of the affinity-based motion prediction model.
- In-depth evaluation and comparison.
- Iterative improvement.

Requirements:

- Very good programming skills in Python.
- High personal motivation and independent working style.
- Very good language proficiency in German, English or French.

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The thesis should clearly document the individual work steps. The candidate undertakes to complete the term paper independently and to indicate all scientific aids used.

The submitted work remains the property of the chair as an examination document.

Prof. Dr.-Ing. M. Lienkamp

Betreuer: Loïc Stratil, M. Sc.

Ausgabe:_____

Abgabe: _____