

Bachelorthesis / Semesterthesis / Masterthesis

Risk-Aware Motion Prediction in Autonomous Racing Using Particle Sampling

Are you captivated by the challenge of making autonomous vehicles safer and more reliable in high-speed environments? Embark on an innovative thesis project that explores risk-aware motion prediction in autonomous driving. This project leverages particle sampling and multiple prediction parameters to generate a range of possible trajectories for objects in the vehicle's path. By analyzing the distribution of these trajectories, we can determine the probability of each motion prediction and evaluate the risk of interactions between the ego vehicle and opponents in autonomous racing.



Description:

Autonomous racing contributes to the challenge of making autonomous vehicles safer and more reliable in high-speed environments. One key factor for avoiding collisions but enforce overtakes is the motion prediction of racing opponents. To choose safer trajectories, when necessary, prediction algorithms could determine the probability of each motion prediction and evaluate the risk of interactions between the ego vehicle and opponents in autonomous racing.

The aim of this thesis is to develop and implement a risk-aware motion prediction system for autonomous driving using particle sampling. This method involves generating multiple predictions by varying parameters or employing different prediction approaches around the object of interest. The distribution of these predicted trajectories allows us to assess the likelihood of various outcomes and evaluate the associated risks in vehicle interactions. This approach enhances the ability of autonomous racing systems to make informed decisions under uncertainty, improving safety and performance on the track.

Work packages:

- Design and Implementation of Particle Sampling Method and integration into current software stack
- Analyze the distribution of the generated trajectories to determine the probability of each potential motion and develop algorithms to evaluate the risk
- Evaluate the system's performance in predicting and mitigating risks in vehicle interactions

Requirements:

- independently familiarize yourself with the topic
- creativity
- a structured way of working
- knowledge of ROS2
- programming experience in C++

Contact:

If you are interested in this project, send your CV, transcript and a short motivation to:

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