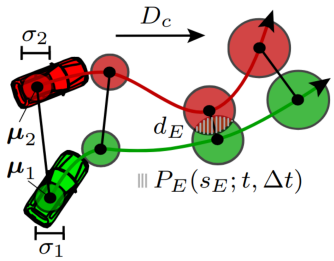
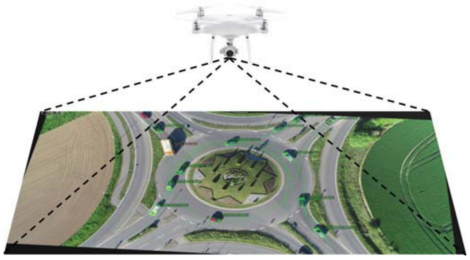
Karlsruhe Institute of Technology

Bachelor's Thesis / Master's Thesis





Probabilistic risk estimation [1] (left), Bird's eye view roundabout from [2] (right)

Probabilistic Risk Estimation: A Comparisson between Ground Truth Data and Statistically Independent Trajectories

When operating higher level autonomous vehicles on the street it is crucial to guarantee that no collision occurs. Therefore, research focuses on safety (e.g. [3]) and risk based approaches. While safety is given when no collision occurs, the planned trajectory can still be risky. The advantage of using risk for assessing trajectories is, that it can be modeled in a probabilistic way and therefore uncertainties can be taken into account. However, current risk metrics do not address the dependency between trajectories and thus consider them statistically independent, which is not the case in reality.
Within this thesis the correlation in terms of risk between statistically independent planned trajectories and ground truth (GT) trajectories should be analyzed. The results can then be used to develop a novel approach for assessing the risk of trajectories and identifying risky situations.

The proposed thesis consists of the following parts:

+ Literature research about state-of-the-art safety and risk metrics
+ Comparison of GT and independently planned trajectories
+ Choosing an appropriate traffic dataset for the comparison, e.g. [2]
+ Developing a novel risk assessment approach
+ Evaluating the approach compared to other risk metrics

I am happy to answer any question you might have. Feel free to ask for an appointment or directly come to my office!

References

[1] J. Eggert and T. Puphal, "Continuous Risk Measures for ADAS and AD," 2017.
[2] R. Krajewski, T. Moers, J. Bock, L. Vater, and L. Eckstein, "The rounD Dataset: A Drone Dataset of Road User Trajectories at Roundabouts in Germany," in 2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC), 2020.
[3] S. Shalev-Shwartz, S. Shammah, and A. Shashua, "On a Formal Model of Safe and Scalable Self-driving Cars," CoRR, vol. abs/1708.06374, 2017.

Institute of Measurement and Control Systems (MRT)
Prof. Dr.-Ing. Christoph Stiller

Advisor:
Marlon Steiner, M.Sc.

Programming language(s)[1]:
Python advanced

System, Framework(s):
Linux

Required skills:
- Work with traffic datasets
- Work on your own

Language(s):
German, English

For more information please contact:

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Or directly send in your application including your current grades as well as our questionnaire!

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[1] **skill levels:**

beginner	< 500 lines of code (LOC)
advanced	500 – 5000 LOC
proficient	> 5000 LOC