Interdisciplinary Project
Learning-based Control of an Off-Road Vehicle

Task

Automation of vehicles is becoming increasingly important, not only in the automotive sector, but also in agricultural machinery. Field operations such as autonomous mowing, pruning, seeding, and spraying can be performed by agricultural robots. Navigation of vehicles along a predefined path has been intensively studied in the past years. However, there are cases requiring challenging maneuvers, which cannot be predefined easily. To navigate the vehicle under kinematic and environmental constraints, it is of interest to find the optimal behavior or policy over a time interval. Since supervised learning methods heavily rely on previous knowledge and human-labeled data, methods such as reinforcement learning (RL) using trial-and-error interactions with the environment have gained considerable attention.

The focus of this study is investigation and implementation of a learning-based control scheme for an agricultural vehicle in specific scenarios.

Work packages
- Literature review on learning-based control methods
- Selecting an appropriate method considering the use case defined with the thesis instructor
- Implementation and application of the method to a tractor-implement system
- Theoretical and simulative discussion of the reliability and robustness
- Documentation (preferably English) - conversations can be either German or English

Prerequisites
- Being a good team player
- Good skills in python
- Basic prior knowledge of machine learning
- Basic knowledge in control theory
- Motivation to learn new topics
- Structured and independent way of working

Remote work and meetings at Campus Garching are possible.

Start: April-May
Send your application by email to ertug.olcay@tum.de including
- A short email elaborating your background and motivation
- Curriculum vitae (CV) and your current transcript of records

Adviser: Ertug Olcay
ertug.olcay@tum.de

https://www.amx.wzw.tum.de/