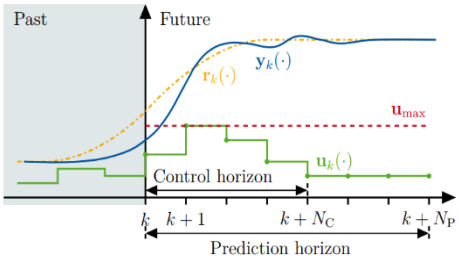
Master Thesis: Model Predictive Control for Trajectory Following of Automated Guided Vehicles

Motivation:

In recent years, intralogistics has experienced a steady transformation that has led to a rapid increase in the intelligence of automated guided vehicles (AGVs). Whereas until a few years ago, AGVs mainly traveled on guided lanes, the vehicles can perform increasingly complex maneuvers planned online, while autonomously avoiding obstacles. While path tracking controllers are classically implemented with PID controllers, model predictive controls (MPCs) are more appropriate for these requirements. This allows kinematic and kinodynamic constraints as well as obstacles to be explicitly considered. In addition, MPC can also incorporate nonlinear system models.
We, ek robotics GmbH, offer you an interesting master student position (m/f/d) to design a model predictive trajectory control, test it simulatively as well as evaluate it on a real AGV.

What awaits you?



The goal of this project is to implement path control of our driverless transport systems with an MPC. Kinematic and kinodynamic constraints should be considered while local obstacles should be avoided. The project will roughly consist of the following steps:

- Establishment of a possible simple but sufficiently accurate system model of a tricycle kinematics.
- Derivation and solution of the optimal control problem with CasADi considering obstacles.
- Extension with the "Receding Horizon" principle with the tool acados.
- Simulative as well as experimental validation using one of our vehicles (Vario Move, Compact GG, etc.)
- (possibly) extension with other kinematics like a Quad, Omni, etc.

What do we offer?

- Fixed-term contract, initially limited to 6 months, with an option to extend and take over
- Mobile working: Depending on your needs, you can work both mobile and on-site with us
- Work in a motivated team and enjoy a high degree of creative freedom and short decision-making processes

What qualities do you bring?

- Good knowledge of control engineering (especially model predictive control)
- Good knowledge of Python and ROS
- Independent and goal-oriented way of working
- Knowledge of CasADi/acados is an advantage.

Are you curious? Apply now!
https://ek-robotics.softgarden.io/job/15584613