Self-Driving Vehicles

Course Description

This course focuses on the foundations of autonomous vehicles and starts with a detailed introduction to relevant safety standards in terms of functional and IT security.This course continues with a presentation of the concept of sensor fusion and discusses relevant aspects of computer vision techniques such as feature detection, calibration, and semantic segmentation.A large part of the course concerns localization and motion planning. Relevant motion models are introduced and localization techniques such as odometry, triangulation, and satellite-based systems are discussed in detail, along with path planning, motion prediction, and trajectory generation.

Contents

1. Sensors
   1. Physical principles of sensors
   2. Types of sensors
   3. Sensor calibaration
   4. Application scenarios
2. Sensor Fusion
   1. Elaborating data from sensors
   2. The Kalman filter
   3. Object tracking
3. Computer Vision
   1. Pixels and filters
   2. Feature detection
   3. Semantic segmentation
4. Localization & Motion
   1. Motion models
   2. Trilateration
   3. Satellite-based localization
5. Motion planning
   1. Mission planning
   2. Behavior Planning
   3. Local Planning
6. Safety Standards
   1. Functional Safety
   2. Safety of Intended Functionality
   3. IT Security