Objective and System Design

Objective
Generate a set of reasonable future trajectories for each vehicle

Goal
Define potential conflict areas between two vehicles

Probabilistic Lane Assignment

Conditions & Assumptions
- All traffic lanes are represented by corresponding centerlines
- Each traffic lane in the vicinity of a vehicle represents a possible hypothesis for its future motion path
- Due to uncertainties a stochastic model for all input data (sensor and map) is used
- Stochastic residual vector as distance measure between relevant properties of vehicle and nearest lane point (NLP) state
- Modified multivariate cumulative sum (mod. MCUSUM) algorithm to determine the time evolution of the distance measure
- \( \chi^2 \)-test of resulting squared mahalanobis distance (MD) leads to the significance level (\( \xi \)) of the lane hypothesis

Map-based Motion Prediction

Conditions & Assumptions
- Extended Kalman Filter (EKF) used for motion prediction with kinematic bicycle model and constant acceleration models
- Map information from NLPs is used in both steps of the EKF:
  1. Prediction: wheel steering angle \( \delta_a \) from the course of the centerline
  2. Innovation: generate pseudo-measurements from NLPs
- Conflict areas occur as a result of the overlap of two trajectories