Trajectory Planning and Formation Control for Automated Driving

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**Car-2-Car Communication**

- **No C2C**
  - Adaptive Cruise Control (ACC) (large inter-vehicle spacings)
  - Prediction of other vehicles
  - Lane reduction = traffic jam?
  - Advantage: no wrong information
  - Disadvantage: limited efficiency

- **With C2C**
  - Cooperative ACC (small inter-vehicle spacings)
  - Exchange of intentions
  - Cooperative merging
  - Advantage: efficient maneuvers
  - Disadvantage: time-delays/attacks...

**First Order Sliding Mode Controller with small initial spacing errors using feed-forward: acceleration of the preceding vehicle is communicated**

**Networked Control Systems**

- Perfect communication:
- Delayed communication ($\tau = 0.25$ s):

**Application to Model Trucks**

- **Data**:
  - Trucks (1:14) with Beagle Bone Board
  - Position tracking via webcams (GPS)
  - Implementation of assistance systems
  - Real-time capability

- **Scenarios**:
  - Longitudinal and lateral trajectory tracking
  - Lane change
  - Collision avoidance
  - Cooperative merging (no C2C)

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