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Integration of Car-2-Car Communication as a Virtual Sensor in Automotive Sensor Fusion for Advanced Driver Assistance Systems

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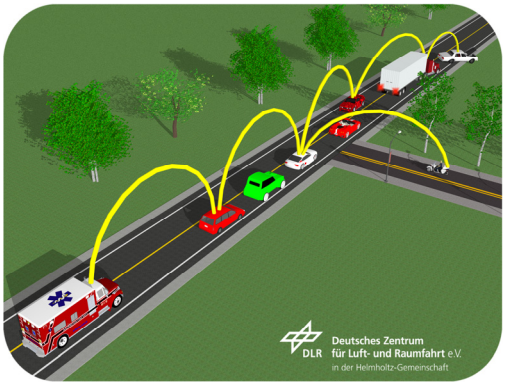
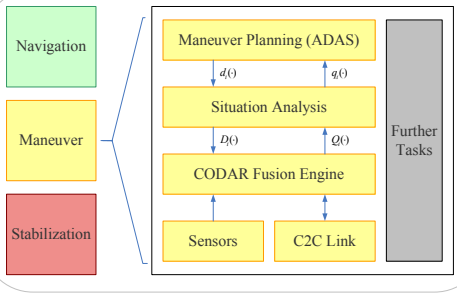


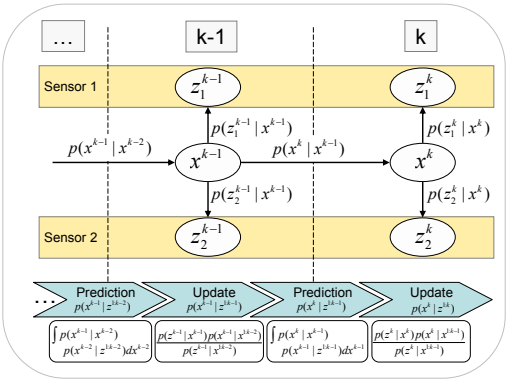
Car-2-Car Communication

- Wireless communications between vehicles (inter-vehicle communication) and between vehicles and infrastructure
- Exchange of *orthogonal*, *complementary* or *redundant* information over short-medium range exceeding line-of-sight horizon
- Use cases:
  - Traffic Jam Warning,
  - Cooperative Collision Avoidance, …

System Architecture

- Service-oriented system architecture
- Flexible and scalable sensor incorporation
- Integration of Car-2-Car communication as *virtual sensor*
- Prioritization depending on the demand of driver assistance systems and the current quality of in-vehicle sensors



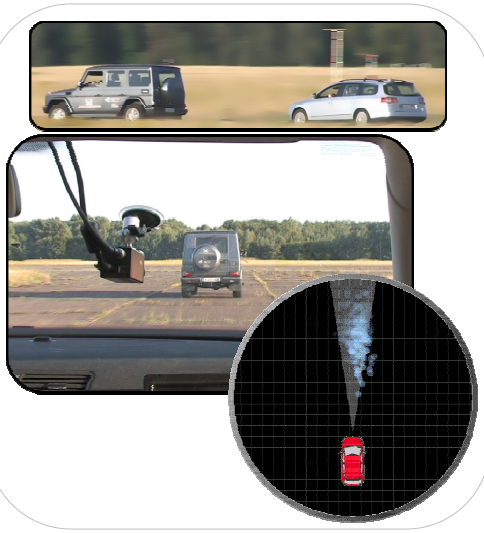


Sensor fusion

- Sensor measurements are inherently subject to *noise*, *malfunctions* and *physical sensing limitations*
- Dynamic state estimation based on multiple sensors enables filtering of sensor imposed uncertainties
- Bayesian filtering with *non-linearity* and *non-Gaussian* noise in state transition and sensor model
- Sequential Monte-Carlo methods: Particle Filter

Cooperative Adaptive Cruise Control (CACC)

- Automatic gap keeping based on Car-2-Car communication
- Reliability by dynamic incorporation of various sensors (radar, Car-2-Car communication, GPS, INS, etc.)
- Better foresight due to *movement prediction* and *transmission of movement causes* (e.g. brake pedal activation) instead of effects (e.g. distance decrease)



+ Improved safety (timely & reliable reaction)
+ Improved traffic efficiency (closer safe gaps)
+ Improved comfort (less unnecessary deceleration)
+ Improved energy and material usage (e.g. use of engine brake or recuperator instead of service brake)

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