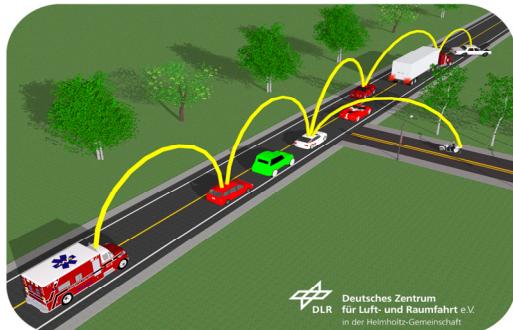


V2V Communications in Automotive Multi-sensor Multi-target Tracking

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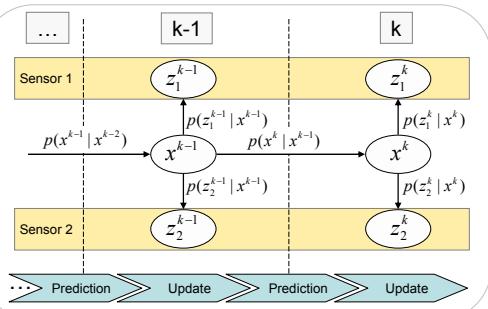
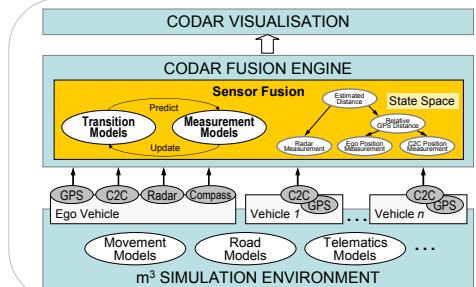


Vehicle-2-Vehicle Communications

- 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, Cooperative Adaptive Cruise Control, ...

Cooperative Object Detection And Ranging (CODAR)

- Dynamic probabilistic situation estimation
- *Flexible and scalable* sensor incorporation
- Integration of V2V communication as *virtual sensor*
- Service-oriented architecture (completely OSGI based)
- Plug'n'Play vehicle deployment



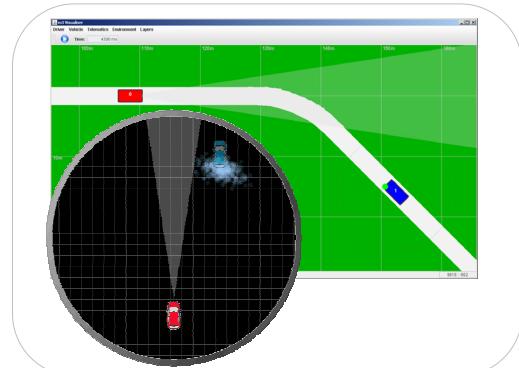
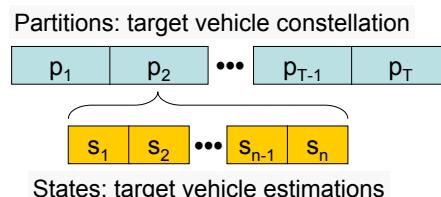
Particle Filter

- Sequential Monte Carlo method for Bayesian inference given inaccurate and incomplete observations
- Recursive Prediction-Correction-Process
- Single particle encodes a *weighted hypothesis* describing a *possible state of the world*
- State of the world represents a target vehicle constellation

Multi-target Multi-sensor Tracking

- Multi-sensor: e.g. Radar + V2V Communication
- Multi-target: Joint Multi-target Probability Density (JMPD)
- States are separated in T partitions
- Transition model for partitions and states
- Measurement Model for partitions and states

State Space



Conclusions

- Exploitation of redundancy & complementarity of information increases *accuracy, reliability and robustness* of situation assessment
- Better foresight due to movement prediction and transmission of movement causes (e.g. brake pedal activation) instead of effects (e.g. distance decrease)
- Enabler for future situation-aware driver assistance with improved *safety, efficiency and comfort of driving*