

Inter-Vehicle Perception: Concept and Challenges

Reasons for inter-vehicle perception

Local perception systems

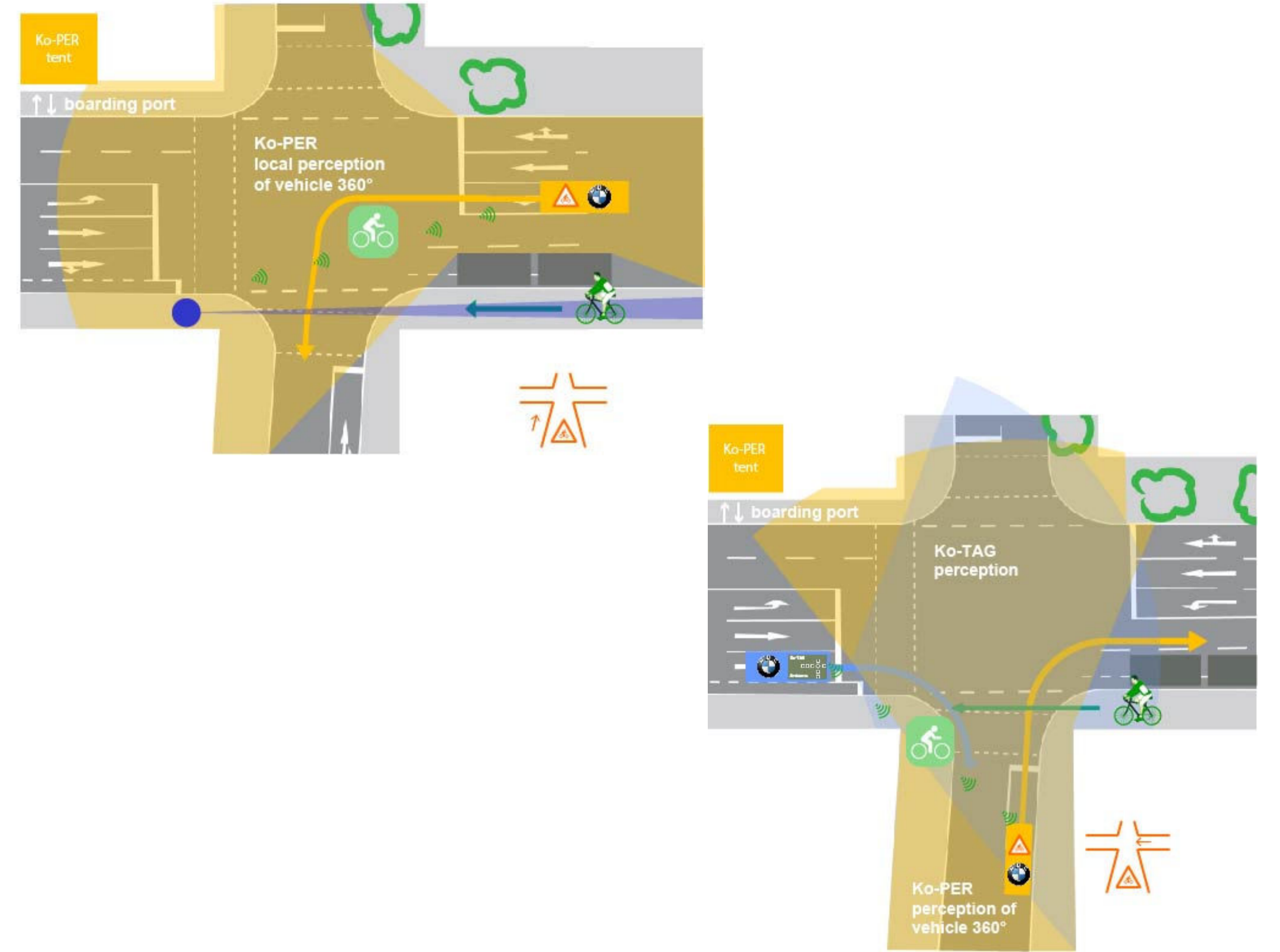
Limited field of view
Occlusions

Vehicle-to-vehicle communication

Strong dependency on number of equipped vehicles
Need for precise and robust global localization

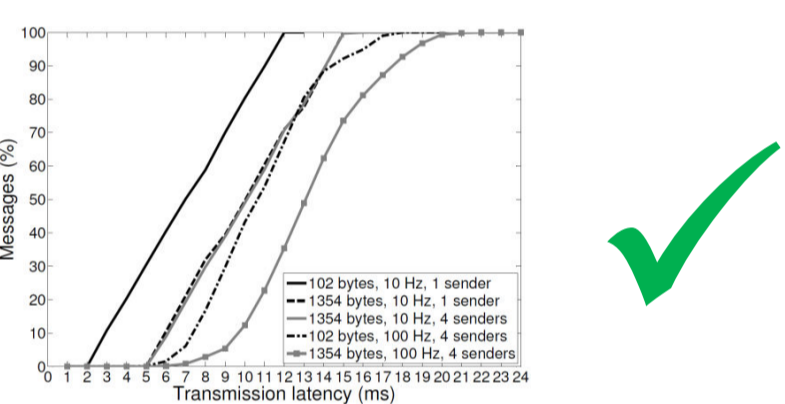
Combination of both approaches

Broadcast of local perception data from equipped vehicles and roadside stations via V2X communication
Fusion of communicated perception data with local perception data in host vehicle → inter-vehicle perception

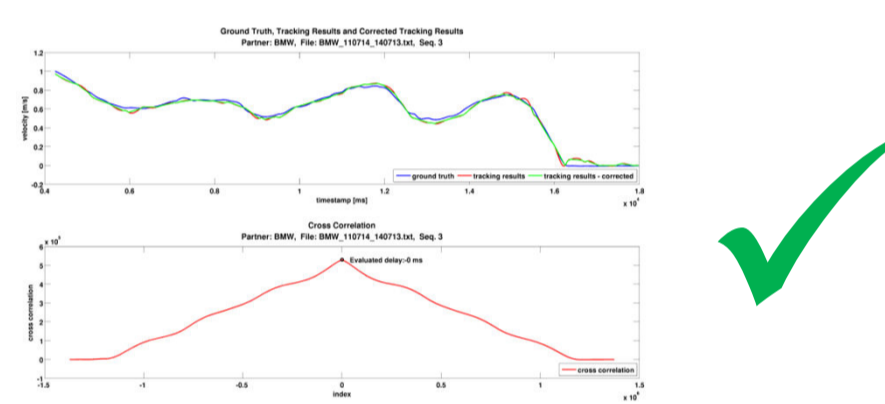


Challenges

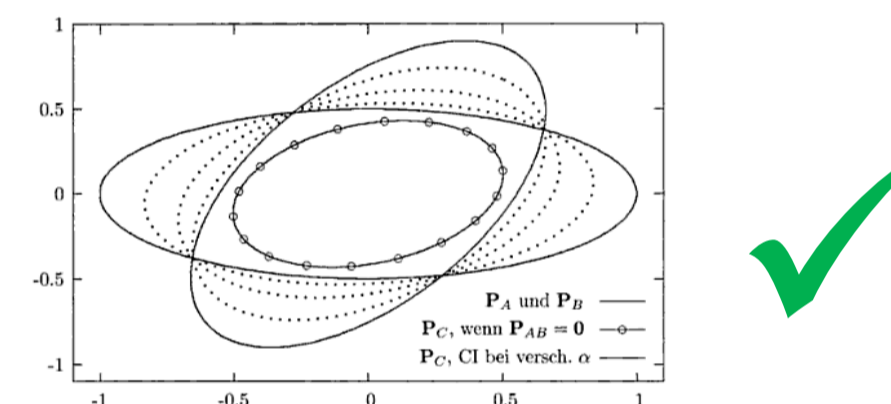
Transmission delays



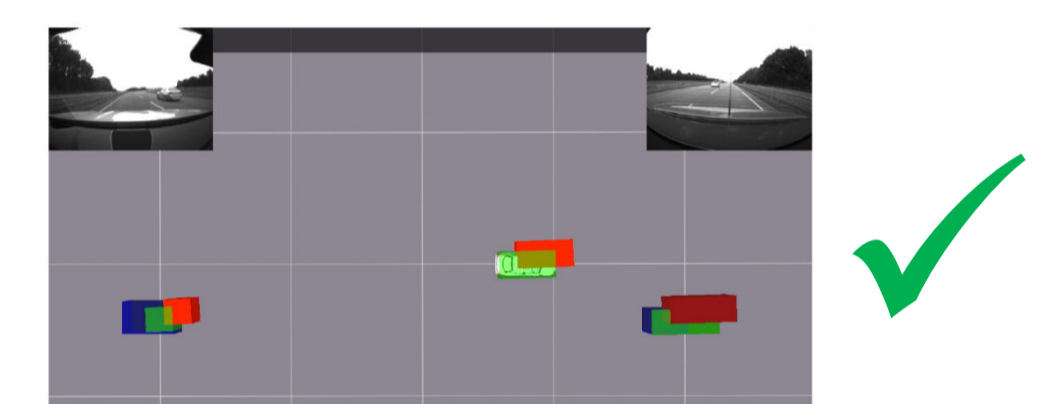
Global timestamps



Data correlation

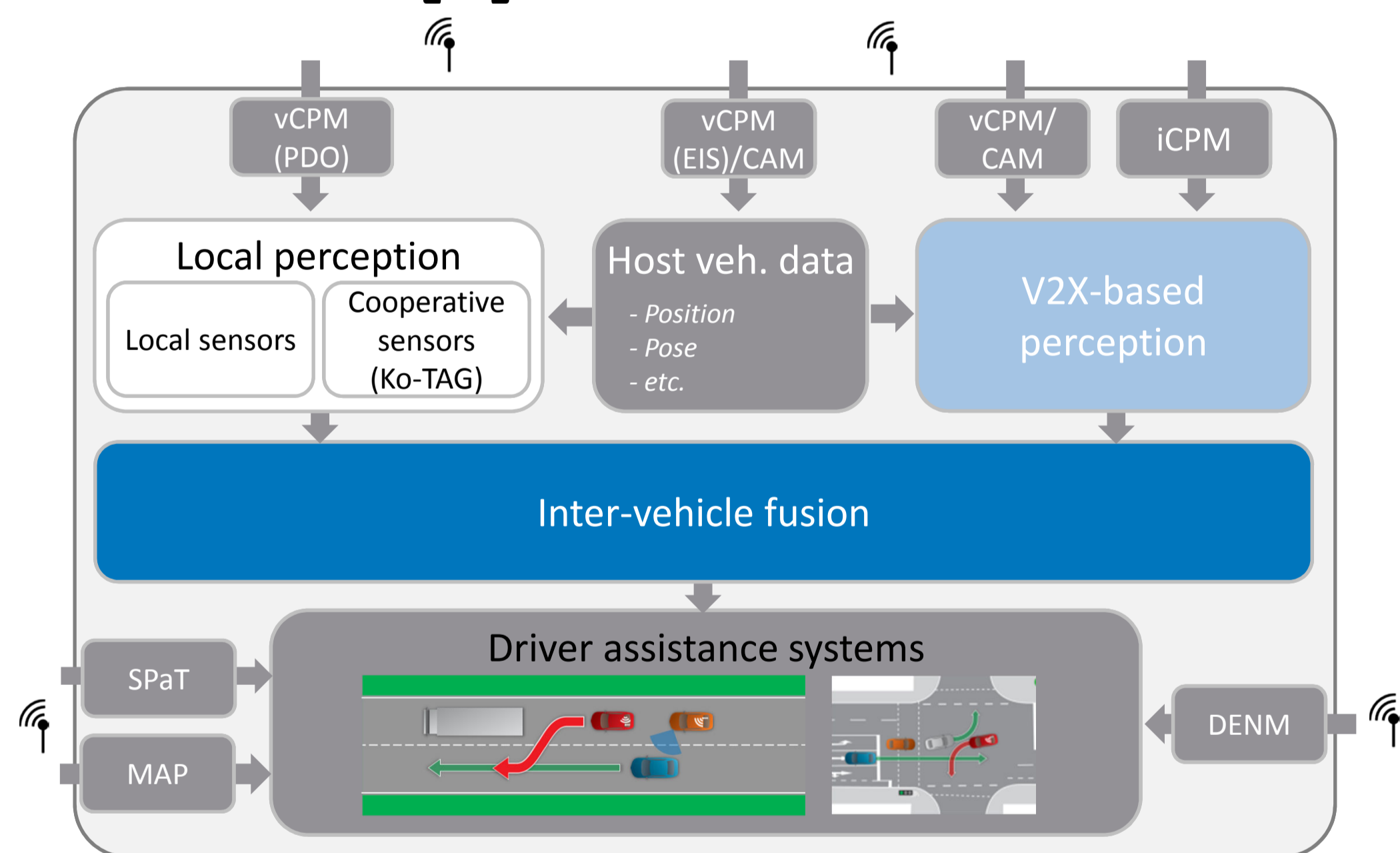


Association and fusion



Concept

Architecture [1]:

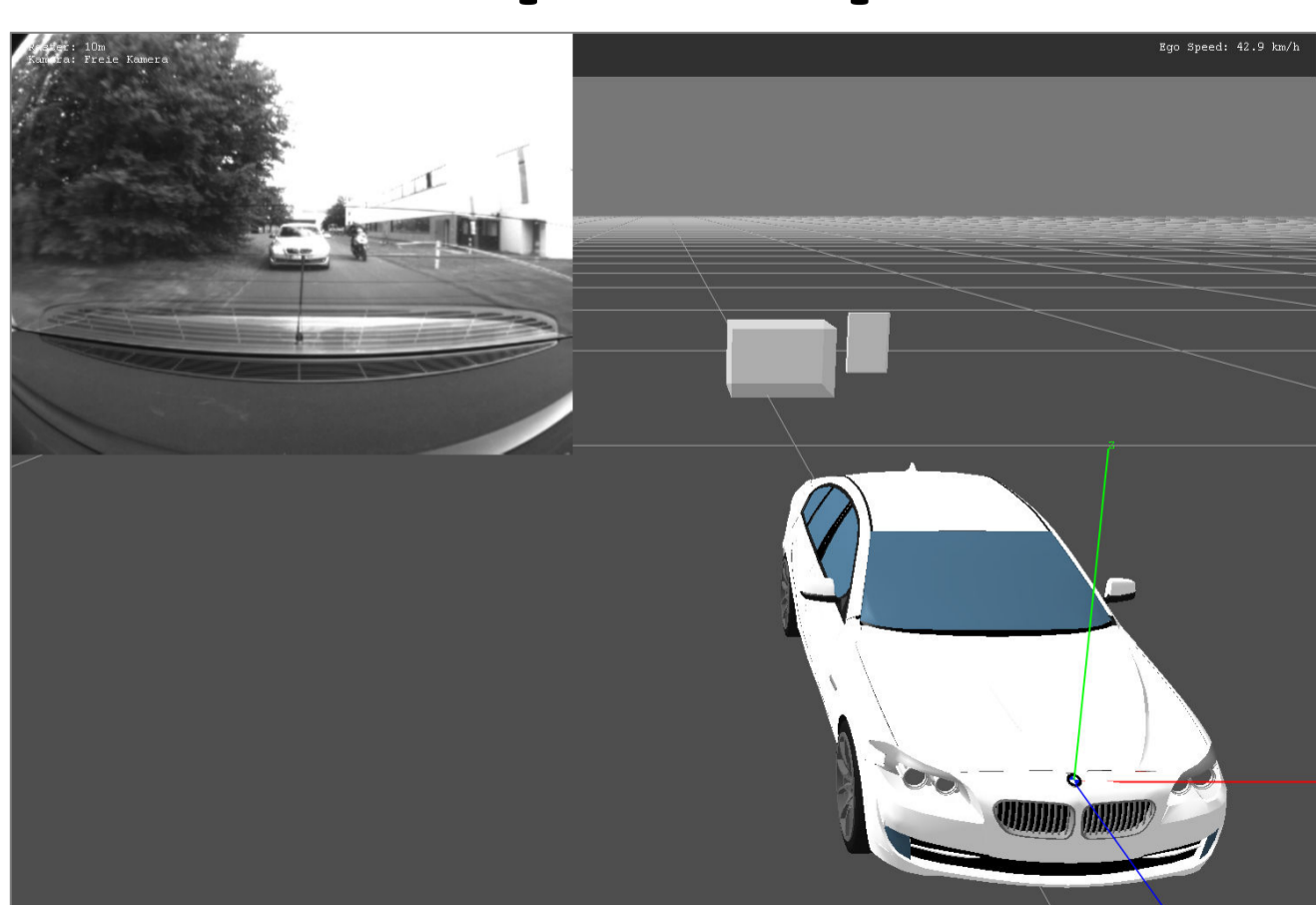


Features:

- Division into local and global fusion → solves problem of correlated data
- Fusion of tracks from local perception and V2X communication
- Integration of cooperative sensors (Ko-TAG) in local perception
- Specified and implemented V2X messages :
CAM (Cooperative Awareness Message), CPM (Cooperative Perception Message), DENM (Decentralized Environmental Notification Message), MAP (intersection geometry and topology), SPaT (Signal Phase and Timing)

Realization → Prerequisites for demonstrations at Ko-PER test intersection

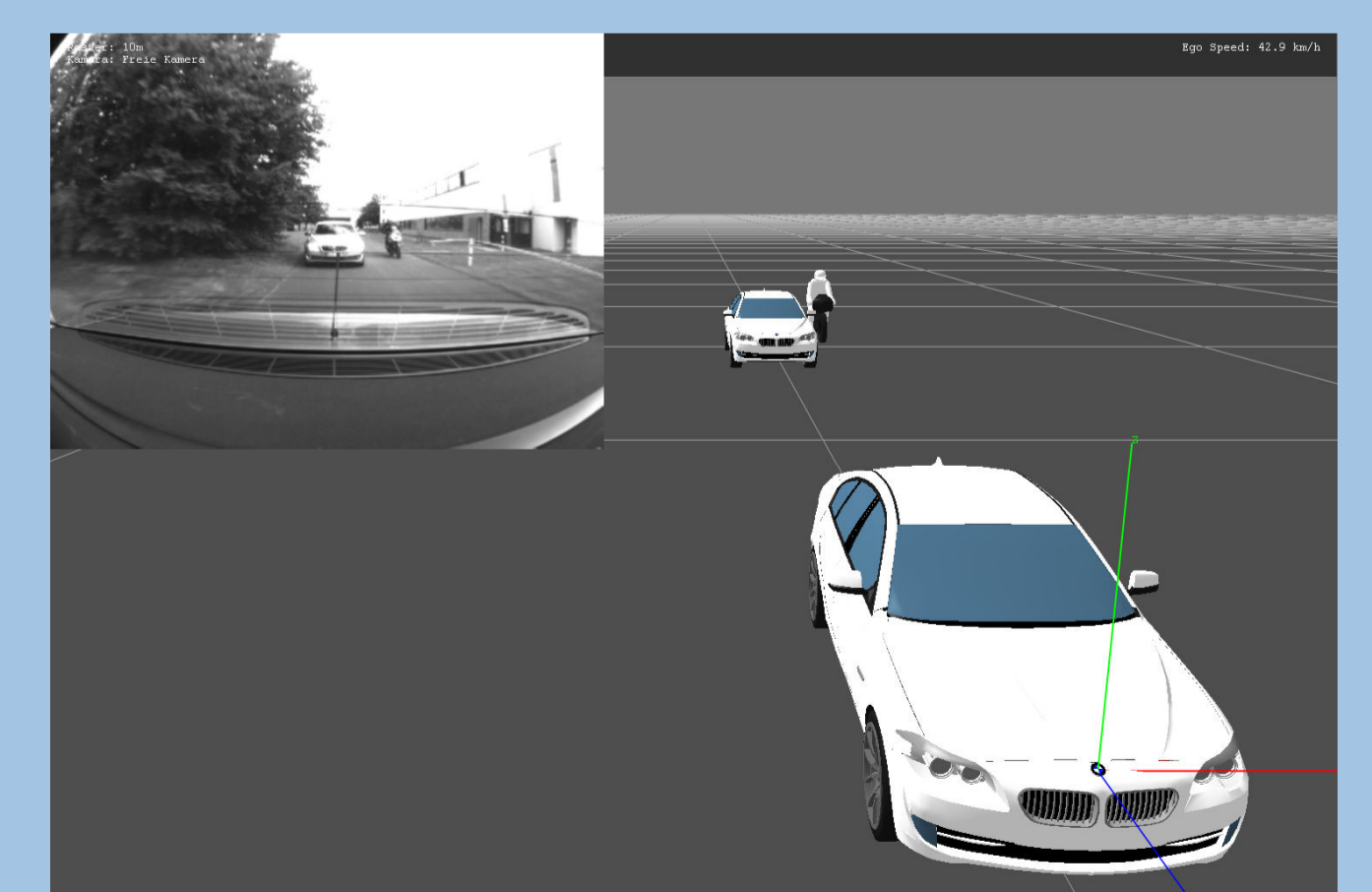
Local perception



Inter-vehicle perception



V2V communication



[1] A. Rauch, F. Klanner, K. Dietmayer: Analysis of V2X Communication Parameters for the Development of a Fusion Architecture for Cooperative Perception Systems, Intelligent Vehicles Symposium 2011 (IV2011), Baden-Baden, Deutschland.