Fraunhofer IVI

# Smart Infrastructure

**Infrastructure enables CCAM in complex city scenarios**

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## Smart infrastructure

Urban traffic is complex and intersections are often traffic and accident hotspots. Smart infrastructure assistance, e. g., for protecting VRUs, is crucial building block for enabling infrastructure-assisted automated driving. While modern vehicles can already utilize their own sensor-based object detection, the parametrization and categorization of objects from within the moving car is challenging. Shifting those tasks to the road infrastructure, on the contrary, allows reliable distinction between static and dynamic objects.

Infrastructure supports automated driving by

- Implementing cooperative environment perception
- Enabling cooperative driving maneuvers
- Ensuring the functional safety of cognitive functions
- Providing court-usable data logging

Shared security responsibility and risk of manipulation

- Vehicle manufacturers
- Infrastructure operators
- Communication service providers

## C-ITS traffic management

**Management of traffic situations & road network**

- Coordination of anticipatory and cooperative driving with communicated driving recommendations
- Extended representation of traffic situations: fusion of several road users' environmental perceptions
- Connection to traffic lights, other RSU, C-ITS backend and traffic management
- Various other decentralized and cloud-based communication infrastructures beside RSU network

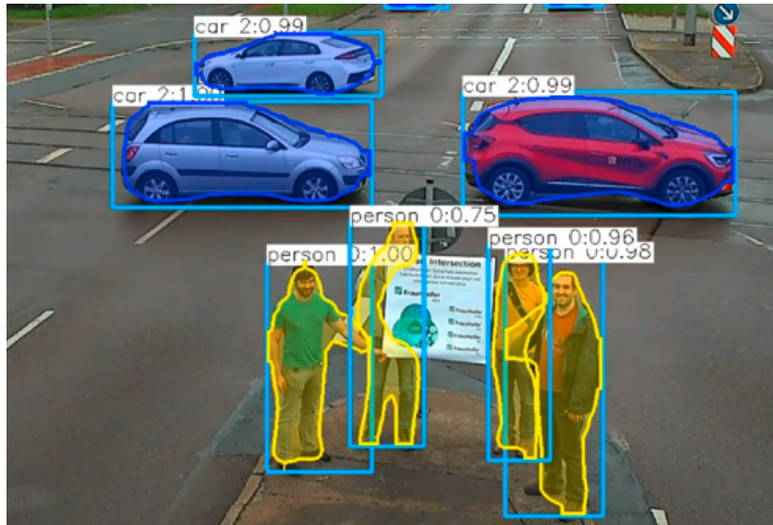
**Cooperation & postioning**

- Communication technologies for connecting vehicles and transport infrastructure
- V2X, V2I, V2N, V2V, …
- Hybrid communication approach: WLAN-p, 5G and C-V2X including facilities
- Wireless sensor networks (UWB) for positioning and communication
- GNSS positioning
- Data safety and Public Key Infrastructure (PKI)

## Infrastructural safety for CCAM

Fraunhofer Smart Infrastructure development and deployment enables infrastructural safety for CCAM and focuses on the seamless integration of connected automated and conventional vehicles in inner-city areas assisted by a smart infrastructure. In order to accomplish this goal, innovative basic services as well as advanced features are provided by a heterogeneous cloud and communication infrastructure.

The smart infrastructure supports automated vehicles, from the communication of information through assistance to remote control. With the help of the infrastructure, the vehicles Operational Design Domain (ODD) can be expanded, especially in complex traffic situations.
The assistance provided by the infrastructure is defined by Infrastructure Support Level for Automated Driving (ISAD), which starts at the conventional infrastructure Level E and ends at Level A, where the infrastructure uses its traffic perception capabilities for microscopic traffic management.



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In the future, we will achieve sustainable, efficient and safe mobility in cities through cooperation and infrastructure assistance.«

**Dr. Thomas Otto,**
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## Contact

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in cooperation with

**Fraunhofer Cluster of Excellence Cognitive Internet Technologies CCIT**