Automotive Requirements for Future Mobile Networks

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Motivation
- Customer Expectation
- Expected Mobile Data Traffic
- Vision of Automatic / Autonomous / Cooperative Driving
- Tele-operated Driving

Requirements
- Quality of Service
- Ultra low End-to-End Latency
- High Data Rates

Future work items
- Coverage Extension
- Predictive Communication

Conclusion
Customer Expectation

Reliable connection in all traffic situations and locations for future advanced driver assistant systems (ADAS) → QoS

Communication using different network operators, independent of the contract of the vehicle occupants (safety relevant info)
Collective Perception of Environment and Related Data Rates

Example See-Through Use Case

- Video transmission from the trucks’ lane-departure-warning camera to the vehicle behind
  - Video stream of 1.7 Mb/s @ 640x480 pixel @ 15 Hz
  - Video stream of 12 Mb/s @ 1280x720 pixel @ 25Hz

- Use the camera signal of other vehicles in the environment model of ego-vehicle

- Enhanced reality projection for situation awareness e.g. overtaking a slow vehicle

Camera view of truck

Video via 5G
Video images of the surrounding and control inputs are transmitted between the vehicle and the remote operator workstation via mobile connection.

Quelle: ATZ, M. Lienkamp, TU München Teleoperated driving
5G-Communication: Device-to-Device And Relaying

Connected: ubiquitous coverage
Predictive Communication

Using unique properties:

- Form factor
- Antenna placement
- Vector of motion
- Energy resources

Prediction via:
Sensors, Maps, Extracted features, Cooperation

Potential improvements:
- Localization of scatters
- Deep fading prevention
- Channel estimation: Precoding
- LOS to NLOS detection
- Spectrum and TX technique selection

Strong reflection
Weak reflection
LOS Communication
Conclusion
Automotive Requirements for Future Mobile Networks

- Reliable and ubiquitous connection for future advanced driver assistant systems (ADAS)

- High data volumes at low latencies for future cooperative automatic driving functions
  - for the Direct Communication between Vehicles
  - and for applications like e.g. tele-operated driving.

- Communication using different network operators, independent of the vehicle occupants contract (safety relevant information must be forwarded)

- Complement to the WLAN-Based Vehicle2X Technology (IEEE 802.11p)
Thank you!