Reliable and safe HD maps for automated driving

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From OADF workshops to ISO standardization

Workshops

- ADASIS
- NDS
- SIP-adus
- SENSORIS
- TISA
- TN-ITS
- other contributors

Open AutoDrive Forum

Discussion Thread: Eco system architecture
Discussion Thread: HD maps and functional safety

Publications

- **SAFETY FIRST FOR AUTOMATED DRIVING**
  - Safety first for automated driving

- **Published ISO/TR 4804:2020**
  - Road vehicles — Safety and cybersecurity for automated driving systems

- **Published ISO/AWI TS 5083**
  - Road vehicles — Safety for automated driving systems

Standardization

- **Published**

- **Publication expected for spring 2024**
Structure of the ISO/AWI TS 5083 HD map chapter

Using HD maps in driving automation systems

• Differences of SD and HD maps
• How HD map data can support safety
• Impact of poor HD map reliability on availability and safety
• Definition of Reliable Map Attributes (RMAs)
• Detectable vs non-detectable attributes
• Selection of RMA sets
• RMA deviation types
• Mitigation of risks from RMA deviations

RMAs: Map attributes with significant impact on safety/availability
Map data can be used to improve ADAS and AD safety

Operational design domain (ODD) limitation
- Takeover request in time before end of automated driving area

Support for insufficient sensor performance
- Bad weather (snow, ice, fog), country specific signs, physical hacking

Location based information that can not be derived from sensors
- Road clearance for automated driving by car manufacturer, country specific rules

Localization
- GNSS map matching, landmarks

ADAS: Advanced Driver Assistance Systems, AD: Automated Driving
Multiple aspects must be considered

- Functional Safety (ISO 26262)
- Nominal Performance (ISO 21448)
- Cyber Security (ISO/SAE 21434)
- Safety in Use (ISO 21448)
- Active/Passive Safety

Hardware or software not working according to the specification
Insufficient performance of sensors / algorithms / actuators
Unauthorized access or attack
Hazardous misuse / misunderstanding, mental overload
Accidents not caused by the ego-vehicle systems
Potential origins of map-reality deviations

- Map data error
- Map update interruption
- Reality change
- Map data error
- Map update interruption
- Map data error
- Map inaccuracy
- Map provider error
- Map data error
- Localization error
- Map data error

ISO 26262

Automated Vehicles

In-car Usage

Data Collection
- Sensor data
- Third party data
- OEM Preprocessing

Map Production
- Map data
- Map data error

Externalities
- Environment
- Transmission

OEM fleet (automated and manual)

Map provider fleet
RMA deviation types

- Map inaccuracy
- Map data errors in the car
- Other map data errors
- Real-world changes
- Map update interruptions
- Localization errors