Automated Driving L3 and beyond – the key aspects

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Landing in today’s event: Intro

DARPA challenge 2010

L3-L4 real-world testing landscape

[2017-2021]
SAE L3 automated driving system and beyond (HAD)

No minimal risk maneuver by the system...

Minimal risk maneuver by the system
Safe operation
- Degradation
- Fail-operational
- Verification and Validation of automation

Data management
- determination
- boundaries

Legal and regulatory clariness around the world

User responsibility
- Driver mode recognition
- HMI

ODD
- determination
- boundaries

Supporting infra
- digital
- physical

Vehicle operator/ADS handovers
- Transitions of AD modes
- Transition of control

Security
- Risk analysis
- Anti-threats SW

Legal and regulatory clariness around the world
Challenges to be discussed at the summer school

1. Automating data testing toolchain incl. simulations

**Challenge**

- Reduce *iteration cycles* and other processes to accelerate the development of the autonomous vehicle fleet
- Manage the *data* generated by self-driving vehicles and identify novel situations to increase consumer safety
- Accelerate the process of “teaching” vehicles how to handle unique environmental conditions (*edge case identification and testing*)

**Targets**

- Reduced “time to drive” and “time to analyze” to accelerate delivery of autonomous vehicles to the marketplace
- Automated end-to-end approach from data ingestion and processing, via neural network training to functional testing, and in-car deployment
- Accelerated progression through the sequences of autonomous driving levels for increased ROI
1. Automating data testing toolchain incl. simulations

Solutions

- Expedite data analysis to reduce the learning curve for intelligent AV controls
- Leverage simulation and end-to-end engineering toolchains to manage massive data flows in native vehicle data formats
- Automate deployment of functional testing

Example of EB platform
Challenges to be discussed at the summer school

2. Cybersecurity

- Threat analysis and risk assessment tuned for AD systems where shared responsibility of user and driver missing (L3Pilot paper in this direction)
- Timely detection and rapid response to threats
- Safety and security co-engineering: Resilience
- Central (national?) Response to information security incidents – CERTs for AD road users

Solutions

- Security by design: a holistic approach (not only vehicle but the eco-system)
- Security automation
- Practices for Creating an Effective Computer Security Incident Response Team (CSIRT)
Challenges to be discussed at the summer school

3. Infrastructure amendments and the (V2)X factor

Challenge

• Manage updates of existing infrastructure
• Manage the costs for reliable connectivity
  (road operator core business affected by connectivity and automation)
• Design for the transition period where both AVs and traditional road users constitute the traffic
• Install new elements specifically for supporting AD
• Training road operators

Solutions

• Hybrid connectivity models (ITS-G5 and cellular)
• User-centered research focusing on challenging urban environments (e.g. Smart intersections)
• New definitions for infrastructure support to AD and automated transport (e.g. Inframix project)
• Involve road operators in C-ITS roadmap by EC
Challenges to be discussed at the summer school

4. Control and shared User/AD system responsibility

**Challenge**

- Keep the vehicle user aware and in the loop always
- Keep the road user aware about AV intentions
- Determine and measure driver’s takeover time (from AD to manual operation)
- Model interactions of vehicles and humans at different driving scenarios → use that to train AVs

**Solutions**

- Study in simulation and real life, driver workload and cooperation with the automation
- Study in simulation system/user transitions of control
- Design eHMI elements for AVs to other road users interactions

Image ©2017 T.Louw phd thesis
Challenges to be discussed at the summer school

5. AD Public road testing admission

**Challenge**

- National regulations differ / no regulations is a problem
- Roads quality may differ from country to country
- Safety driver presence may alter the results
- L3 and up perception and control system not mature

**Solutions**

- Common CodeOfPractice to be followed by the industry proposed by EC
- Design dedicated fields for AD trials where close to reality scenarios can be reproduced
- Raise public awareness on the AD characteristics

Join Tut. A!
Summer School synopsis

**Day 1**

**Tut. A**
AD key aspects, L3Pilot CoP, Public roads testing admission procedures

**Tut. B**
How automation affects drivers’ performance in transition situations requiring control- and tactical-level responses

**Tut. C**
New paradigms for infrastructure support to AD and automated transport

**Tut. D**
Hidden cyber threats in the HAD ecosystem and possible countermeasures

**Day 2**

**Tut. E**
Enhancing existing pipelines that will support the creation of new testing scenarios

**Tut. F**
Teach car-driving agents to navigate never-before-seen roads within simulations
Thank you for your kind attention.

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