Evoluon Congress Center
Helmond Automotive Campus

13th ITS EUROPEAN CONGRESS
FULFILLING ITS PROMISES
Brainport Eindhoven, the Netherlands | 3-6 June 2019

HAN AUTOMOTIVE RESEARCH

RAPP

Driver training and testing in the era of automated driving: Status quo and future directions

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PRAUTOCOL project (NL):
Certification of drivers and cars in the field of autonomous driving

PRAUTOCOL

Paper TP1762 – 4 June 2019 – Session TS12

Automated vehicles: Now and in the near future

SAE Level 1 and Level 2 systems are becoming common, e.g. Adaptive Cruise Control, Lane Keeping systems, Tesla Autopilot

Automated vehicles: Now and in the near future

SAE Level 3 systems are on the shelf (e.g. Audi A8 AI Traffic Jam Pilot, BMW iNext/i5, Mercedes-Benz DRIVE PILOT) and Level 4 will follow soon thereafter (e.g. Ford, Volvo: 2021)

Automated vehicles: Now and in the near future

EU Commission proposal adopted to make a set of safety and driver assistance features mandatory on new vehicles (new regulation on type-approval requirements)

For example:

- Intelligent Speed Assistance
- Advanced Braking Assistance
- Lane Keeping Assistance
- Driver Distraction and Drowsiness Recognition

Due to become mandatory as from May 2022 for new models and as from May 2024 for existing models

Automated vehicles: Now and in the near future

Question: Are we sufficiently informed and trained to use such systems?

(... or shall we continue to rely on the trial-and-error method)

Licensing the driver: Current legislative context

Europe:

- Directive 2006/126/EC (Third Directive on Driving Licences, 2013)
- Theory test and test of skills and behaviour (practical driving test)
- No explicit provisions concerning automation technology in driving tests for Category B
- Only technical criterion for vehicle used in practical driving test is vehicle capable of speed > 100 km/h

The Netherlands:

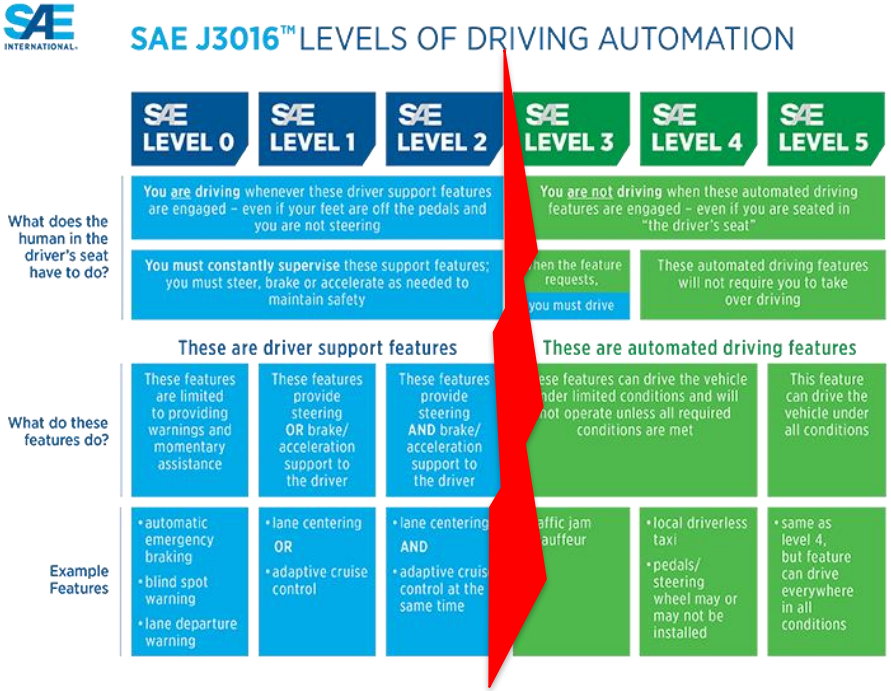
- Above directive is transposed into national law
- No requirements regarding vehicle or use of driver assistance systems (except for navigation system)
- Since 2016 use of driver assistance systems is allowed (except for automatic parking aid)
- Assessment of safe driving (overall picture), regardless of using driver assistance systems

Allowed span of driving with automated vehicles

SAE Level 0-2:

"Traditional" road traffic laws apply, since driver is still fully in charge, e.g.

- NL: Wegenverkeerswet
- DE: Straßenverkehrsordnung



SAE Level 3-5:

Special regulations introduced, e.g.

- NL: 2015/2017 regulations for testing self-driving vehicles with/without driver on board
- DE: 2017 new legal framework on conditional (Level 3) or highly (Level 4) automated driving functions

New driver tasks and responsibilities: Also with Level 1-2 systems

- Know which systems are on board your (private/lease/rental) vehicle, including their functionalities and limitations
- Know how to operate them (HMI)
- Determine when activation or deactivation of a system is appropriate
- Monitor the driving environment, execute parts of the driving task not being conducted by the system and respond if necessary
- Supervise the dynamic driving task executed by the system, be mentally engaged and intervene when required by the environment or by the system

Waking up ...

- Wait-and-see attitude from past years is slowly disappearing
- Role of the human driver changes from being an active operator to a passive supervisor
- Also lower-level vehicle automation introduces new tasks and responsibilities for which additional driver skills and knowledge are necessary

=> Driver training and testing will need to change

For example acknowledged by:

- EU Studies (e.g. Implementation of Driving Licence Directive; Study on Driver Training, Testing, ...) (2017)
- FERSI Code of Principles for “Safety through Automation” (2018)
- New Directive for professional drivers (Directive (EU) 2018/645)
- CIECA Congress “Modern Technology for Safe Driving” (5-8 June 2019)
- NL: Evaluation of CBR (organisation responsible for assessing driving ability, education of examiners)

Some developments in the Netherlands

Survey among driving schools and driving examiners about
Advanced Driver Assistance Systems (ADAS) in the driving test (SWOV & CBR, 2018)

As long as ADAS will not be a mandatory part of licensing procedures, driving schools will not necessarily opt for (expensive) ADAS when buying their fleet or train their candidates

Opinion of driving examiners:

- ADAS in driver training (almost unanimous)
- ADAS in theory test (majority)
- ADAS in practical driving test (less pronounced, more in favour than against)

Question: Do you agree to include ADAS in future training and testing procedures?

Some developments in Germany

All currently available driver assistance systems may be used in practical driving test

Lack of legally binding evaluation criteria

=> User instructions (TÜV | DEKRA arge tp 21, 2019) first step towards specific legal requirements

Support for candidates, examiners, instructors, officials, etc.

Description of systems and examples of driving errors, e.g.

- No immediate take-over of driving task when necessary (e.g. ACC does not detect sudden cut-in vehicle)
- Increased distraction when operating the system
- “Inappropriate” use of a system (e.g. ACC on exit lane) is NOT a driving error by itself

Some developments in Germany

- With increasing automation, the breadth of training and exam content is increasing
- The driver must have all the skills of manual driving and the correct use of automated driving functions up to and including the automation Level 4
- Towards future with driver assistance systems being mandatory part of driver training and testing

First step already seen in theoretical test (new question added in April 2019):

2.1.07-120	Video	Zusatzwissen	B	4

Die Geschwindigkeitsregelanlage (Tempomat) Ihres Kraftfahrzeugs ist auf 130 km/h eingestellt. Wie verhalten Sie sich jetzt richtig?

Ich muss

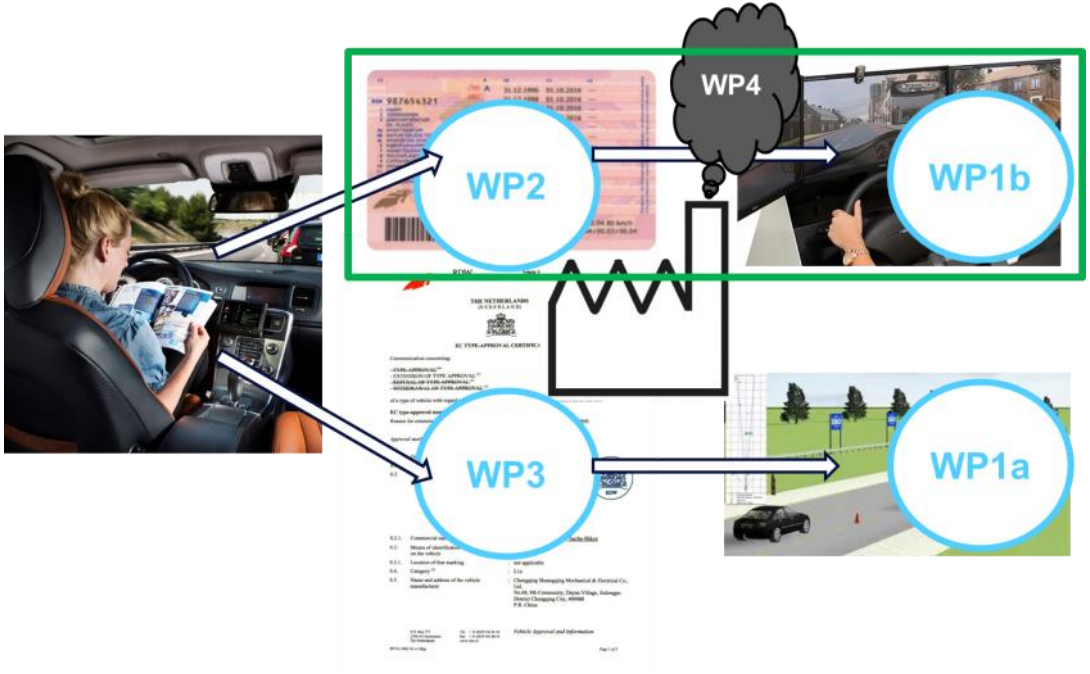
[X] - den Sicherheitsabstand durch Bremsen wiederherstellen

[0] - das Motorrad überholen

[0] - auf den rechten Fahrstreifen wechseln

PRAUTOCOL project

2017-2019, lead by HAN University of Applied Sciences (NL)



Licensing the driver:

Development and evaluation of tools to support the assessment of drivers of automated vehicles

1. Literature review
2. Analysis of current assessment framework
3. Evaluation of assessment tools

PRAUTOCOL project

Important preliminary results:

- Assessment of a learner driver changes when automation is being used
- ADAS causes both interruptions and temporarily rises in task level required from the driver
- Is the learner driver capable of switching between the required task levels, while safeguarding adequate perception, anticipation and the interests of other road users?
- Developed a tool for investigating changes in driving behaviour when driving with/without systems
- Based on Brief-A (Behaviour Rating Inventory of Executive Function, Adult) with two formats: self-report and informant report
- Comparison between manual driving and role as a supervisor to see how the assessment changes
- Preparing several field tests to evaluate our tools and verify our hypotheses
- Exploring how driver training and testing should increase drivers' ability to correctly operate automated vehicles and take full advantage of them

More information: **Paper SP1795, Wed 5 June, Session SP03, 10:30-11:30**

Conclusions

- Do not overlook that also lower-level systems significantly change the driver tasks!
- Drivers should be provided the necessary level of understanding to use the technologies properly, efficiently and in the safest manner possible
- Based on knowledge and hands-on experience on what a system is capable and not capable of
- To minimize potential risks from system abuse or misunderstanding

Policy considerations:

- Add the use of vehicle automation (esp. current Level 1+2 systems) in driver training and make it a standard component in theory and driving tests
- Make specific safety features mandatory in vehicles used for driver training and testing (e.g. hereby following the proposed EU regulation)
- Add the topic of vehicle automation to the education programs of driving instructors and examiners

Thank you for your attention!

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