What if technology takes over all driving tasks?

Software Driving License

Gerben Feddes RDW & Jorrit Kuipers robot TUNER

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Agenda

1. Software Driving License
2. ISO proposal
3. Next steps
1. Software Driving License
Cora van Nieuwenhuizen, minister of Infrastructure and Water Management at the Intertraffic 2018 Amsterdam:

“I’m going to create legal framework for automated driving. Laying down requirements for reliability and safety that cars must meet before they can hit the road. A driving license for self-driving cars, if you like. Not for the driver – but for the car itself!”
The Dutch Vehicle Authority **RDW** and the Dutch Driver Exam Authority **CBR** are challenged to develop a driving license for **Artificial Intelligent drivers = software**.

RDW and CBR invited **robotTUNER** to support them with expertise related to automated assessment of driving behaviour and AI.

RDW, CBR and robotTUNER initiated the ‘Digital Driving License Project’. A collaboration of stakeholders who want to attribute to an international standard for licensing of intelligent vehicle operating systems.

**Digital Driving License Project → Software Driving License**

Goal of this presentation is to share our ideas and motivate you to join the Digital Driving License Project.
Constant change

Feddes also says the evolving nature of software will necessitate radical reform of homologation procedures. “With software being constantly updated, a car is an ever-changing vehicle and there is no point in one-off admittance – you need to apply performance-based requirements,” he says. “A car has to perform in a certain way and it’s up to the manufacturer to produce acceptable means of compliance. We’ve learned from aviation and drone legislation – we’re moving away from the how and beginning to focus on the what.”

Another issue to settle is who is liable if an accident does happen. Where decisions leading to a crash are made by a machine, can some of the blame be laid at the manufacturer’s door? With regard to its current, partially automated systems, Mercedes-Benz says “no”. The company issued a statement in April 2016, as part of the Daimler Sustainability Report, which puts the onus on the consumer: “The legal situation in Germany and many other countries is clear: with regard to current, partially automated systems, the driver remains responsible. Although systems such as Lane Keeping Assist in the new E-Class provide support, the driver must still control the vehicle.” However, the report did concede that “manufacturers are responsible for damages from product defects”.

“WITH SOFTWARE BEING CONSTANTLY UPDATED, A CAR IS AN EVER-CHANGING VEHICLE AND THERE IS NO POINT IN ONE-OFF ADMITTANCE”

Gerben Feddes, senior advisor for intelligent mobility at the Netherlands’ vehicle authority, RDW
NEW ADDITION IN THE TYPE APPROVAL PROCESS

SOFTWARE AUTOMATED VEHICLES

Admittance
- Virtual testing
- Testtrack exam

Surveillance
- Safe and predictable traffic behavior of automated systems

PROCESSES ARE SIDE BY SIDE

CURRENT SITUATION

Admittance
- European Type Approval

Surveillance
- Manufacturer
- Vehicle
- Driver
Software Driving License

Assumptions

• For SAE level 4 and 5.
• Human drivers will be on the road for the coming years, so the autonomous vehicle has to act like a human.
• It’s about showing safe and predictable driving behavior related to human performance.
• Automated systems will have a stepped admission to public roads (SAE: Operational Design Domains).
• Driving simulators can speed up the assessment process.
• The safety assessment of automated driving skills should be a relative measurement. The human peer group sets the base-line.
# Strength/Weakness Report

Click on the lesson date or score to view the lesson results.

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<td>Maintain safe distance from car in front</td>
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<td>Keep to maximum speed</td>
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<td>Turn left at junction with traffic lights</td>
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Stepped admission

Step by step related to traffic complexity.
2. ISO proposal
ISO proposal

RDW, CBR and robotTUNER initiated the ‘Software Driving License Project’. A collaboration of stakeholders who want to attribute to an international standard for licensing of intelligent vehicle operating systems.

An ISO standard will contribute to European regulation and speed up world wide commercial use of autonomous vehicles in public space.
ISO proposal

Initial group
NVIDIA, AON Risk Solutions, Ricardo, HAN-Automotive Research, 2getthere, Roborace and initiators RDW, CBR and robotTUNER.
ISO proposal

Draft proposal (ISO)
‘Safety of Intelligent Vehicle Operating Systems’ (SIVOS)
Proposed process of testing:

1. Virtual Environment
2. Scale Modelling
3. Proving Ground
4. Driving Exam
5. Driving License
6. In Use Compliance
1 Virtual environment

- From simulators used for training humans, we know the ‘average human driver’ performance in a broad set of ‘traffic situations’ (use cases, or Operational Design Domain).
- The AI-driver ‘competes’ in a virtual environment against this average human driver.
- Knowledge (theory) and skills are tested and related to human performances and risk profiles.
- The safety manager of a supplier can provide the evidence
2 Scale Modelling:

• The validity of simulation output is not proven yet. Scale modelling is a (traditional) cost effective method for live tests.

• The impact on the traffic system can be assessed using scale modelling and augmented reality. Stress testing (e.g. hacking) can show vulnerabilities.

• Standard hardware is used. Only the software is tested (sensor testing belongs to vehicle testing).

• Under supervision of RDW
ISO proposal

3 Proving Ground

• To make sure the software and hardware are integrated well by the manufacturer, a real life test on a closed proving ground is performed for validation purposes.
• Happy flow tests and stress tests (aviation).
• Under supervision of RDW
4 Driving Exam

• Just as for humans, the last step is a driving exam on public roads. In this exam (45 min - 1 hour) some situations from a predetermined list should be negotiated positively.
• Validation of safe interaction in complex traffic situations
• Under supervision of CBR
ISO proposal

5 Driving License

• For the specific use cases / Operational Design Domain’s, the AI-software obtains the driving license (ISO certificate) = stepped admission.
• The innovation strength / reliability of a manufacturer counts.
• RDW will give approval after licensing by CBR = compliance with the digital driving license methodology
6 In use compliance

• Given the ever-changing software, monitoring is needed when the vehicle is used on public roads. Unsafe software updates, hacking or malicious software would otherwise not be noticed.

• Traffic flow is monitored for detection of anomalies. Abnormal behavior such as ignoring traffic rules or endangering other road users. Those vehicles that are detected as an anomaly need to be rechecked by auditors, or pulled of the roads if necessary.

• Software version shows the fitness of the software.

• Under supervision of RDW (software APK)
3. Next steps
Next steps

• ISO proposal ‘SIVOS’ now at NEN: Dutch National Standardization Organization.
• Approved by Technical Committee (NC 345042).
• Official proposal in preparation.
• Q2 2018: forming working groups.
• First stepped driving license in the Netherland in 2019.
• And hopefully: a new ISO standard in 2022!

NOTE: development of a new ISO standard is only possible with international support and resources!
Next steps

We start with pilot projects in the Netherlands. In these projects we develop and test the digital driving license methodology.

- 2018 Ommelander Hospital, NAVYA in cooperation with the Province of Groningen
- 2019 Rivium 2.0, 2getthere