Munich, Tuesday, 30 October 2018

Position Paper on Policy and regulatory needs, European harmonisation

Summary

Currently, non-existent, incomplete or diverging national legislative approaches still form a major obstacle on the path to the market introduction of automated and especially autonomous vehicles. Therefore, from the perspective of the European industry and CAD research community, it is strongly desirable to create a regulatory framework which is as unified as possible. The harmonization of the various rules is in the best interests of a functioning European internal market.

However, there are risks of over- and under-regulating. Over-regulating might leave no room for innovations, whereas, under-regulating as a consequence would lead to far too much latitude when it comes to key questions such as legislation and type approval; subsequently risks would be transferred to the society.

The European industry appreciates the European legal framework. If Europe will not lead the field, then others will, with different legal foundations. Europe should play a pioneering role in the global network.

Motivation

Regarding vehicle development, infrastructure development and user behavior, autonomous driving will be one of the megatrends of the coming decade and even beyond. Potentials are divers and huge – for individuals, society, environment as well as for the prosperity and competitiveness of national economies.

For Europe, digitization of public and private transport and the speed of development of automated driving represents an opportunity to become the worldwide leader in the field. Speed and expertise in development leads to landmark innovation and fast solutions. Regulators need to make basic policy decisions soon so motorists can benefit the most from this technology. Furthermore, a unified legal framework contributes to the social acceptability of driverless vehicles.

Introduction

In order to protect the society from unsafe and less environmental friendly motorized vehicles, vehicle registration authorities apply vehicle approval standards. Vehicle manufacturers have to proof that their vehicles are in compliance with those standards.

Currently, non-existent, incomplete or different national legislative approaches still form a major obstacle on the path to the market introduction of automated and especially autonomous vehicles. Therefore, the goal of the legislatures should be the creation of a regulatory framework as unified as possible. The harmonization of the various rules is in the best interests of a functioning European internal market.

The right conditions should be put in place so that vehicles can assume tasks that today only the vehicle's driver is allowed and able to perform. For automated vehicles, Level 2 and higher, these standards need to be developed.

This position paper explores the current status and future regulatory needs of legislative bases and success factors for the approval of automated vehicles on public roads.

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Latest Developments and Current Regulatory Status

The "Vienna Convention" of 1968 states that the driver must be in control of their vehicle at all times. According to the amendment by UNECE (the United Nations Economic Commission for Europe) in March 2014, highly automated systems that continue to have a driver ready to take over the driving functions, and who can override the system and switch it on and off, will in the future be in accordance with the "Vienna Convention". However, this still presupposes that every vehicle must have a driver. UNECE WP.1 has affirmed already that the 1949 and 1968 Conventions apply to all driving situations except in situations where the vehicle is moved by vehicle systems without any role of the driver – see UNECE WP.1 report of its 75th session, ECE/TRANS/WP.1/159, page 6.
Currently UNECE WP.1 is working on a Draft resolution on the deployment of highly and fully automated vehicles in road traffic which includes recommendations to Contracting Parties of the 1949/ 1968 Conventions on how to safely deploy this new technology.

SAE International provides a taxonomy (last updated in June 2018) with detailed definitions for six levels of driving automation, ranging from no driving automation (level 0) to full driving automation (level 5), in the context of motor vehicles and their operation on roadways. These level definitions, along with additional supporting terms and definitions provided herein, can be used to describe the full range of driving automation features equipped on motor vehicles in a functionally consistent and coherent manner. As such, the recommended usage for describing a vehicle with driving automation capability is "level [1 or 2] driving automation system-equipped vehicle" or "level [3, 4, or 5] automatic driving system -equipped vehicle." The recommended usage for describing a vehicle with an engaged system (versus one that is merely available) is "level [1 or 2] driving automation system-engaged vehicle" or "level [3, 4, or 5] automatic driving system -operated vehicle." In the following, each level is described in detail:

- Level 0 - No Driving Automation
  The performance by the driver of the entire Dynamic Driving Task (DDT), even when enhanced by active safety systems.
- Level 1 – Driver Assistance
  The sustained and Operational Design Domain (ODD)-specific execution by a driving automation system of either the lateral or the longitudinal vehicle motion control subtask of the DDT (but not both simultaneously) with the expectation that the driver performs the remainder of the DDT.
- Level 2 – Partial Driving Automation
  The sustained and ODD-specific execution by a driving automation system of both the lateral and longitudinal vehicle motion control subtasks of the DDT with the expectation that the driver completes the object and event detection and response subtask and supervises the driving automation system.
- Level 3 – Conditional Driving Automation
  The sustained and ODD-specific performance by an automatic driving system of the entire DDT with the expectation that the DDT fallback-ready user is receptive to automatic driving system -issued requests to intervene, as well as to DDT performance-relevant system failures in other vehicle systems, and will respond appropriately.
- Level 4 – High Driving Automation
  The sustained and ODD-specific performance by an automatic driving system of the entire DDT and DDT fallback, without any expectation that a user will respond to a request to intervene.
- Level 5 – Full Driving Automation
  The sustained and unconditional (i.e., not ODD-specific) performance by an automatic driving system of the entire DDT and DDT fallback without any expectation that a user will respond to a request to intervene.

In dependency of the above described levels, the distribution of responsibility between human and vehicle changes. Therefore, ethical standards have to be set to determine how human and machine should behave in different situations. In 2016 the Ethics Commission on Automated Driving was set up by Federal Ministry of Transport and Infrastructure in Germany. It published its Ethics Commission's report comprising 20 propositions on 20 June 2017. The key elements are:

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- Automated and connected driving is an ethical imperative if the systems cause fewer accidents than human drivers (positive balance of risk).
- Damage to property must take precedence over personal injury. In hazardous situations, the protection of human life must always have top priority.
- In the event of unavoidable accident situations, any distinction between individuals based on personal features (age, gender, physical or mental constitution) is impermissible.
- In every driving situation, it must be clearly regulated and apparent who is responsible for the driving task: the human or the computer.
- It must be documented and stored who is driving (to resolve possible issues of liability, among other things).
- Drivers must always be able to decide themselves whether their vehicle data are to be forwarded and used (data sovereignty).

To understand further regulatory needs, there are **two perspectives on regulatory requirements** to be distinguished:

- Firstly, it would be expedient to amend the Member States´ **traffic rules** for highly automated driving functions in order to make the driver's role and obligations more specific and to legitimize secondary and tertiary tasks like phone calls, reading a newspaper or chatting with someone in the back seat as well as using on-board infotainment systems during highly automated journeys, and in general for transferring driving tasks to systems. This should be supported by a European approach that is as unified as possible so that autonomous vehicles driving across (historical) Inner-European borders do not need to adapt to different limits for what they are allowed to do. Also, if there are still driving-related duties for a driver, these duties may not change across Inner-European borders.
- Secondly, **legislation and type approval** have to be adapted so that OEMs, suppliers as well as all other stakeholders in the automotive industry can align their technology development focus on explicit and stable requirements of automated vehicles.

The **current regulatory status** on automated driving is best divided into two sectors which on the one hand include EU, Japan and many other states (UN-Regulation), and on the other hand entail policy and regulatory needs in the U.S., the contracting party of the 1949 convention, and China.

EU, **JP**, **RoW** (UN-Regulation):
UNECE WP.1 has affirmed already that the 1949 and 1968 Conventions apply to all driving situations except in situations where the vehicle is moved by vehicle systems without any role of the driver – see UNECE WP.1 report of its 75th session, ECE/TRANS/WP.1/159, page 6.
Currently UNECE WP.1 is working on a Draft resolution on the deployment of highly and fully automated vehicles in road traffic which includes recommendations to Contracting Parties of the 1949/ 1968 Conventions on how to safely deploy this new technology. Additionally, there are some concrete developments to be mentioned:

- A first concrete regulatory framework is currently being developed; highly automated driving (HAD) with speeds of up to 130 km/h is estimated to be approved in about 2019.
- Simultaneous extensive lobbying activities from both established market players and new entrants aiming towards the expansion and acceleration of fully automated driving (FAD).
- Amendment of traffic road regulations is in place in order to enable HAD and FAD with security driver. The next evolutionary step will represent a further regulatory improvement by 2020 which includes a proposal for the distribution of responsibility between driver and vehicle.
- Different complementary country-specific rules were established or are currently developed (for example modification of road transport law in Germany, in 2017 or currently, establishment of a legal framework that includes requirements for reliability in the Netherlands).
- Concerning certification process, based on the OICA proposal made to WP29 and group ITS/AD process a task force for the assessment of automated vehicles (AutoVeh) was established. This consists of four areas to be discussed: DSSAD, Physical Certification Tests, Real World Test Drive, and Audit. DSSAD focuses on data survivability related topics. The other three areas refer to these use cases: urban, highway, interurban and Parking for L3, L4 and L5. They are described in the following:
  - Type Approval Test: Dedicated, reproducible worst-case tests for specific scenarios that cannot be guaranteed to occur in real world test drives.

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- Real World Test Drive: Test drive to assess the vehicle's standard behavior in public road traffic, compliance with traffic laws and maneuvers according to defined checklist.
- Audit: OEM provides e.g.: Safety concept / functional safety strategy, simulation and development data to verify vehicle behavior in edge cases, manufacturer's self-declarations, etc.

US:
The new "Automated Vehicles Policy" and the "AV start act" show a wide range of demands on development and safety verification. The present drafts are expected to be unified to one legal framework in the first half of 2018, and afterwards being signed by the president to become law and thereby foundation for the development of new Federal Motor Vehicle Safety Standards (FMVSS) by the National Highway Transport Safety Agency (NHTSA). The drafts do not show any unsolvable demands.
For testing automated vehicles are officially allowed in Nevada, Florida, Michigan, California, and in the District of Columbia. States like Texas, Arizona and Wisconsin have rejected autonomous car laws. Even without specific legislation, automated vehicles are legal in every state of the United States, unless they explicitly prohibit it.

CN:
China plans to adopt the UN Regulations (technical requirements will be similar to those developed in the Geneva UN working groups), additionally China is preparing extensive new regulations (30 new standards until 2020, 100 new standards until 2025). Up to now, it is unclear, what the outcome of these regulations will mean to the industry.
Current focus topics regarding China as possible AD market are for example:
– On-road testing and driving on roads (AD vehicles are not allowed to test or drive on public roads).
– HD map and localization (HD map has limitations on precision and information).
– Data collection, transfer, and storage (Collection of geo-information is restricted, Restrictions on data-transfer outside of China are in preparation.
– Homologation related standards (More than 100 standards for ICV are being introduced until 2025).

In general, the risk of restrictions based on industrial policy considerations is ever-present (possible rejection of external tenders or licenses for navigation maps).

Future Regulatory Needs/ Challenges

The **five main challenges** in the area of policy and regulatory needs as well as in European harmonization have been defined as follows (see also D.5.2 Future Research Needs):

– Challenge 1: Today, the work of industry and the discussions with national and EU stakeholders (governments and their agencies) concentrate on research, testing and type approval. First activities which are focussing on the development of traffic rules have started in some countries. What is the total scope of affected policy and regulation?
– Challenge 2: On research and testing: How to bundle and coordinate EU research activities to speed up and not loose in the world-wide competition?
– Challenge 3: On type approval regulation: Level 2 is still under strong discussion, Level 3 has not really started yet, for Level 4 and 5 there is no clear view on how to proceed. How can the type-approval approach evolve? How to set up the regulation quick enough to be in place when the technology will be ready? How to develop regulation and technology in parallel in a harmonised way without creating a chicken-and-egg dilemma? How to deal with software updates?
– Challenge 4: How and to which extent adapt and harmonize traffic rules for a quick introduction of higher automation levels?
– Challenge 5: What liability framework needs to be in place to facilitate market penetration from a legal/liability perspective?

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There are many more aspects that need to be addressed regarding policy and regulatory needs and European harmonisation in the field of automated driving. Additionally to the five challenges presented above, the following list provides further input on what has to be tackled with regard to the future of automated driving:

Short term regulatory needs to get the next important steps on track (2020):

- Common European understanding on necessary digital infrastructure quality/coverage for Level 3
- Joint approach between telecom and vehicle industries to support CAD
- Need for cross-border pilot operation projects for a quick rollout of Level 3
- Common European understanding on safety & security validation (when are the systems safe enough)
- European push in setting up the framework for a safe level 4 series development (new UN Regulation, so-called horizontal regulation on accelerator, brakes, steering, lighting, vehicle access)
- Coordinated European and Member state Programs to support global competitiveness
- Adaption of Road traffic rules in Member states (e.g. Germany update presumably 05/17)

Long term vision on policy and regulatory requirements and European harmonization (2040):

- Pan-European approach on overall mobility solutions for cities including electric autonomous shared mobility
- Political framework for the rollout of electric autonomous shared mobility into rural areas (mobility for all)
- Clear common approach for Cities to coordinate Private and Public Transport
- Role of traffic management
- Safe coexistence of automated vehicles and non-motorized road users

Regarding the above mentioned challenges the following priorities have been identified:

– **Speed-up regulation:** How can regulation be adapted in a quicker way aligned with test activities? How will timelines for new regulations and their whole methodology change to allow being as quick as technology evolves? This task will be worked on in follow-up CSA Arcade.
– **Coordination of EU research activities related to regulation and policies**. Type approval in Europe is not consolidated; each UN ECE Contracting Party of the EU member states has its own voice, no EU position, no answers for the prerequisites to a new homologation process “horizontal guideline”. Describe and analyse the total scope of affected policy and regulation for connected and automated driving. Benchmark and collaborate with international initiatives. Support and coordinate the evolution of type approval balancing the regulatory needs and technology development, in relation to software updates and changing user behaviour. The prerequisites have to be found in technological projects. Is this to be solved now or in a strategic research project?
– **Adaptation and harmonization of traffic rules** for introduction of higher automation levels in Europe. Identify national interpretations of the Vienna Convention (e.g. turning right during red light) that hinder the European single market for CAD (L4/L5), especially for new urban mobility.
– **Data sharing and privacy** issues have to be solved as a prerequisite and when new use cases evolve. What is the base for regulation on data handling for CAD? Is this to be solved now or a strategic research issue?
– **Liability** and especially the insurance issues behind have to be solved in the coming years, strategic problem to be addressed, e.g. with the results of real-world-tests: Insurance will take over and then come back on product failures (e.g. subjugation). Insurance supply chain needs to be streamlined, risks of OEM as repository requirements difficult to calculate - less, but more expensive accidents (e.g. truck platooning with more responsibility of the first truck for the whole platoon needs to have a solution).

Success Factors for the approval of automated vehicles

For a successful approval of automated vehicles different effects on society, traffic and safety as well as economy have to be taken into account - the higher the rate of automation and diversity, the higher the effects on each of the mentioned fields. Each field is individually described in the following.

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Effects on society:
On the social level, acceptance for autonomous vehicles has to be increased and thereby limits of the technology have to be made transparent. This should be done by:
- Transparent and comprehensible communication of opportunities and risks.
- Provision of information about recent events like accidents which is sufficient and as objective as possible.
- Definition of socially-rooted minimum safety level of autonomous vehicles as well as establishment of objective procedures to verify.
- Regular evaluation of economic potential with regard to traffic safety, traffic flow, transport performance, workplaces, and new industries.
- Increased investment in research and education concerning autonomous driving and its side effects.
- Accompanying structural changes in the area of commercial freight transport and passenger transport and their implications on changing or new professions.

Effects on traffic and safety:
At the legal level, necessary adaptions of legal framework depending on the specific level of driving automation have to be identified and realized. This includes:
- Adaption of driving behavior law to relieve the driver of his driving task and allow him to conduct other activities instead.
- Verification of the transferability of type-approval requirements on autonomous vehicles.
- Analysis of necessary regulations of behavior of vulnerable road users towards autonomous vehicles.
- Review of data protection to ensure that the connection between vehicles and infrastructure can be successfully developed to increase traffic safety and efficiency.
- Considering whether the establishment of an appropriate institution for situational approval of autonomous vehicles on certain roads would be useful.

Effects on economy:
On the economic level, appropriate international business models as well as financial resources for research and development of necessary technologies are required. This can be done through:
- Definition and implementation of an internationally harmonized framework.
- Definition and establishment of internationally attractive funding programs.

There are many more success factors that need to be taken into account regarding a successful approval of autonomous vehicles. On the one side, vehicle manufactures have to initiate organizational changes to build more dynamic and flexible structures. On the other side, an internationally accepted code of practice between autonomous vehicles and other road user has to be developed. In best case, the new UN regulation should implement the above mentioned topics.
To address these and further topics a task force for the assessment of automated vehicles has been established to discuss the following themes regarding certification process: DSSAD, Physical Certification Tests, Real World Test Drive, and Audit.

Impact (see also D.5.2 Future research Needs)

All technical improvements in the field of autonomous driving are hampered if there is no proper and sound regulatory framework in place. Europe's leadership in the automotive sector can be affected if there are no immediate, collaborative actions towards a coordinated and quick development of European-wide regulations and laws enabling testing and using automated vehicles on public roads.
When severe regulatory issues are being solved, the public will accept and start using automated vehicles sooner which in turn will result in a stronger market penetration and a certain and noticeable competitive advantage in the field of automated driving as well as all the other advantages in automated driving like better traffic throughput, reduced congestion, reduced accidents and a higher quality of life in cities.

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