Input on A.I. in GRVA

FIA welcomes that Artificial Intelligence (AI) in vehicle technology is gaining importance in GRVA. The first summary documents provided by the leadership of GRVA(GRVA-11-03) and Germany (GRVA 12-03) are good impulses and starting points to promote the exchange in the fieldof AI in automotive engineering. There are particular technical, ethical and legal issues in this new field, which need careful consideration.

FIA herewith provides initial comments to GRVA and looks forward to a continued exchange with experts in GRVA. FIA is furthermore willing to join additional discussions (e.g. special workshop or dedicated working group) in order to adequately discuss and accompany this topic in the context of GRVA. FIA is concentrating on the role and the rights of the consumer/driver in the context of AI in vehicles and how this aspect can be implemented in vehicle regulation.

Artificial Intelligence and Vehicle Regulations

I. Context

A. Technological developments

1. Artificial Intelligence (AI) has found some prominent applications in the automotive sector. Some of these applications are related to infotainment and vehicle management (as Human Machine Interface (HMI) enhancement) e.g. infotainment management (incl. destination entry in the navigation systems) including voice assistants, which are software agents that can interpret human speech and respond with a synthesizedvoice. Some applications are related to the development of the safety critical functions (including active safety features, Advanced Driver Assistance Systems and Automated Driving Systems).

B. *Consumers (Drivers and Other Road Users ORU)*

2. *Consumer´s behaviour influences the learning of an AI system in a vehicle, either as a driver of a vehicle equipped with AI technology but also as other road users like e.g., as a pedestrian, a cyclist, motor-cyclist or as a, driver of a different vehicle.*

3. *Drivers need transparent information regarding the abilities of the AI on board of their vehicles as well regarding its limits. This information should be available on demand at any time inside the vehicle and presented in a mode, that is understandable for the driver.*

4. *Drivers should be aware of any learning of a system and set back the software to its basic setting. This is required, if the driver feels uncomfortable or unsafe in his own vehicle after the vehicle has changed its operational behaviour.*

5. *Drivers must be informed about any changing system behaviour, caused by an update of AI capabilities in their vehicles and must have the possibility to refuse update, unless the update is legally required.*

II. Positions expressed at the eighth, ninth and tenth sessions of GRVA in 2020 and 2021

A. Definitions

6. The expert from the Russian Federation suggested that GRVA reviews the definitions provided in ISO/IEC 22989:2020.

FIA supports the proposal to use existing definitions if applicable.

7. Several experts in GRVA noted in previous meetings the importance to not focus on all types of Artificial Intelligence as it would be too broad and not always relevant for the World Forum.

FIA proposes to look on AI in systems that are used in safety, environmental and security performance of a vehicle. These vehicle systems are regulated by UNECE.

8. The AI related technologies currently used in series vehicles suggest that the Artificial Intelligence at stake in this discussion is limited to the kind of machine learning algorithm used to produce a software with a stochastic approach on the basis of data, leading to complex life cycles and qualitatively new challenges (it includes as an example neural networks[1] trained with data.). The nature of the technology involved with its embedding in a noisy sensory-motor-loop implies that outcomes generated by these processes have a probabilistic nature; building software in that way is not primarily based the usual deterministic logic, it is built using probabilistic reasoning algorithms, based on data and statistics.

FIA does not mind, how software is developed. It is relevant that only approved software is installed inside a vehicle. The software itself must be of defensive and ethical proper behaviour.

9. There are two types of use that can be distinguished:

(a) The use of this technology can be for the purpose of developing a software in the system development phase; or

(b) The use of the technology is made in service, in order to train i.e. improve the quality of the system used in operation.

Note: it seems that the key points that define the AI based systems of relevance for WP.29 are:

(a) That quality and quantity of data have an influence for training and testing.

(b) The black box approach of AI.

(c) That output variables can be derived from predictions.

(d) That allows to solve problems that were previously not solvable by classical IT methods and allows to improve the system's performance.

The black box approach is critical and needs clear testing criteria for type approval authorities to test the software at least in simulations. If AI systems are not only learning but also applying the learning directly in the vehicle, then we see the need for defined testing procedures within a type-approval (1958) or self-certification (1998) system.

B. Specific input in the Type Approval context

10. The expert from Norway mentioned the readiness of the existing regulatory framework, which includes UN Regulation No. 156 (Software Updates and Software Update Management Systems), providing a useful basis to address the thematic of the software

evolution supported by AI and also framing the use of "self-training features".

FIA: UN Regulation No. 156 describes mainly processes and documentation for software updates. There are no testing or performance requirements included so far in UN Regulation No. 156. FIA requests to have only software in a vehicle that was actually tested, before it can be installed in vehicles.

C. Safety considerations on the use of online learning

11. The expert from the International Telecommunication Union advised that the useof AI agents should be limited to the development phase. He described the suitable use asfollow:

(a) An AI agent may be trained to produce a software.

(b) Once satisfactory results are reached, the software should be frozen.

(c) The frozen software should then be validated.

(d) Once properly validated, such software can be placed in vehicle.

FIA fully supports that approach

12. The expert from the Russian Federation also stated that self-learning functions inoperation should not be allowed.

FIA supports self-training functions, if the software is approved and "frozen" before it is installed in a vehicle.

13. There is a continuous transition between a static AI system and an AI system whichis retrained online on the edge, i.e. in the vehicle. In between mid-frequency offline retraining combined with a thorough validation and OTA updates offers a compromise that allows adaptations to model drift and model staleness processes while guaranteeing a certain level of safety and security.

FIA fully supports this approach, if it is combined, with the approach of #11 "frozen software"

D. Technology neutrality, as a best practice for regulations

14. The expert from the Russian Federation recalled that the best practices in terms of regulation is to develop technology neutral provision

FIA agrees in principle to a technology neutral approach. Nevertheless, AI in vehicle requires clear test- and performance criteria in a type approval process; a process or a documentation does not meet the safety requirements.

E. Inherent risks posed by the technology with regards to safety

15. GRVA already faced the situation where the probabilistic nature of systems regulated had to be addressed in order to define suitable performance requirements.

16. Notably, Advanced Emergency Braking Systems such as those regulated by UN Regulation No. 152 and which may be developed using for example Machine Learning or Deep Learning based algorithms or any other technology having a probabilistic naturefor the object detection and response, required GRVA to adopt specific provisions as reflected in para. 6.10. (Robustness).

*FIA: Software Testing in Vehicles is currently in a premature state. We regard a multi pillar approach therefore as the best solution: Testing, Simulation, Auditing **before** the software is installed in the vehicle.*

F. Possible ways to address current challenges

17. The expert from CLEPA, having in mind well known risks and challengesassociated with data and AI (See III/B below), mentioned that such risks could be coveredby the audits performed e.g. in the context of the annexes on complex electronic systems(CEL) (See UN Regulation No. 13, 13-H, 79, 152 and 157).

FIA: Any Audits should always be accompanied by physical tests performed by type approval authorities. We prefer a muti pillar approach in all software-based developments of vehicles

III. Other views expressed

A. Defeating the purpose of regulations

18. The representative of the United Kingdom of Great Britain and Northern Ireland mentioned at WP.29 the potential risk that a self-learning algorithm could potentially behave in a way that would be comparable to cycle beating or be a defeat device, as it would learn to respond e.g. to a regulated test cycle.

FIA: Proposes to develop independent (from VM) testing procedures performed in the type approval process

B. Specific risks associated with the use of data to develop a probabilistic algorithm

19. Several prominent cases were reported that demonstrated the potential risksassociated to the use of such technology[2, 3, 4, 5].

20. The quality and quantity of the data has an influence on the bias affecting softwarebuilt using methods of AI.

21. Having in mind some of the challenges mentioned above, the expert from CLEPA mentioned at GRVA that such risks could be covered by the audits performed e.g. in the CEL annexes of UN Regulation No. 13, 13-H, 79, 152 and 157.

FIA: Any Audits should always be accompanied by physical tests performed by type approval authorities. We prefer a muti pillar approach in all software-based developments of vehicles. All ethical requirements must also be part of technical type approval as soon as they can touch safety, environmental or security performance of a vehicle in the traffic as such. Use case based testing required, e.g. pedestrians of different ethics.

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[2] https://eu.usatoday.com/story/tech/2015/07/01/google-apologizes-after-photos-identify-black-people-as-gorillas/29567465/

[3] https://nypost.com/2017/12/21/chinese-users-claim-iphone-x-face-recognition-cant-tell-them-apart/

[4] https://docs.house.gov/meetings/GO/GO00/20200115/110380/HHRG-116-GO00-20200115-SD004.pdf

[5] https://spectrum.ieee.org/tech-talk/artificial-intelligence/machine-learning/in-2016-microsofts-racist-chatbot-revealed-the-dangers-of-online-conversation

IV. Possible way forward in terms of committees' activities

A. The role of GRVA

22. The impact of AI on vehicle regulations go beyond the current activities of GRVA dealing with Automated Driving Systems, Advanced Driver Assistance System, Active Safety

features and connected vehicles.

23.   An example of AI system in vehicles is the Human Machine Interface performing speech recognition and interacting with the driver with regards to the command of head units (incl. navigation systems, air conditioning etc.)

24.   GRVA has been tasked to deal in a first step with AI as it is the group that focus most on digital aspects of technology in vehicles.

22.   After the Chair of GRVA reported to WP.29 (ECE/TRANS/WP.29/1159, para. 66) the representative of OICA explained that some contracting parties wereinitiating regulatory activities having relevance for automated driverless shuttles and thatothers were launching regulatory activities on Artificial Intelligence.

23.   He proposed that WP.29 reflects on the harmonization of these matters. GRVA may wish to contribute to this reflection.

FIA: Safety-, Security- and Environmental-Performance of a vehicle

B.   The role of other groups

25.   GRVA has a role to play to address AI in vehicles when it is about safety, ADAS,ADS and connectivity. But other subsidiary bodies of WP.29 might have to deal in futurewith the specificities of the technologies and the new aspects impacting its work, which may include, among others, data considerations.

26.   Before the inception of GRVA, WP.29 tasked the IWG on ITS to deal with the initial considerations related to automated and connected vehicles. It should be discussed if a similar approach could be chosen was WP.29 with regards to relevant aspects relatedto AI and Vehicles.

FIA: Safety-, Security- and Environmental-Performance of a vehicle

V.   Possible way forward in terms of substantial work; Proposal for a Guidance addressing current known issues

27.   As harmonization of technical regulations in that field is premature, WP.29/GRVA may wish to develop guidance on that matter, in the similar way it has been done on cyber security (See ECE/TRANS/WP.29/2017/46 adopted before UN Regulation No. 155)

FIA: Safety-, Security- and Environmental-Performance of a vehicle

[Draft Guidance document on the use of AI in vehicles]

The [Member States], [contracting parties to the 1958 and the 1998 Agreements],participating in the Working Party on Automated/Autonomous and Connected Vehicles,

Having recognized the significant penetration of some so-called Artificial Intelligence based systems in wheeled vehicles covered in the scope of the agreements administered by the World Forum for Harmonization of Vehicle Regulations,

Having discussed the technical fundamental aspects of some of the systems in automotive products, which are belonging to what the general public calls Artificial Intelligence, i.e. systems developing software with a probabilistic nature using data, it becomes obvious that the use of these systems entails qualitatively new challenges,

Having assessed the potential incompatibility of self-learning systems when the vehicle is in operation with the existing regulatory regimes and with the safety expectations,

Having noted the potential risks that self-learning functions respond in an inadequate manner to test cycles and testing procedures that would lead to defeat device and cycle beating,

Having agreed that it would be premature to harmonize technical regulations on Artificial Intelligence as it would probably impact innovation,

Having acknowledged that the technology was still in developments,

Having discussed that recording and keeping relevant data would support investigations,if need arise, and would help to learn and to inform future regulatory developments,

Have agreed on the following guidance to the stakeholders employing so called AI agent(s) to develop their products:

Online learning

1. This guidance document recalls the existing miles stones of regulatory regimes including, among others, type approval, self-certification, market surveillance, Conformity of Production, In Use Testing, Periodic Technical Inspections and highlightsthe importance that software versions are kept consistently in all vehicles of a vehicle type.

2. Therefore, the stakeholders should not implement online learning

(a) which learn during the operation of the vehicle; and/or

(b) leading to a situation where two vehicles of the same type differ in their retrained AI models.

FIA: Prefer the "frozen" software approach to have self learning available, but in a "controlled" way

3. It is recommended, after having trained an AI-agent to build a software, to freeze that software, and to validate and assess that software with regards to safety and other relevant requirements. Following that process, the validated software may be employed and rolledout in vehicles of a vehicle type. For the avoidance of doubt the frozen software can be updated.

Training data

4. The stakeholders using data to train an AI-agent for the purpose of developing software, including software with a probabilistic nature, should keep record of the data used in training and testing.

5. The stakeholders should ensure that they can provide information in case of inquiry and procedural rights.

6. The stakeholders should implement specific validation methods (regarding safety andother relevant requirements) for systems using stochastic algorithms.

7. The stakeholders should consider and implement possibilities for updates and retraining, to be able to address concerns, non-conformity rectification, recall orders etc.

8. The stakeholders should verify their data in terms of ethics, data protection and privacy, and other general requirements applicable to data in the markets where their product could potentially be used. In the context of the 1958 Agreement, such evaluationscan be performed in the framework of the complex electronic systems (CEL) Annexes (e.g. Annex 6 to UN Regulation No. 79).

FIA: We fully support that AI in vehicles must follow general guidelines on data privacy and human rights. If AI must adapt its behaviour in cross border situation. UNECE should determine a worldwide minimum set of settings that must always apply. The vehicle must detect in what country it runs and what traffic laws apply there.

Black box effect

9. The stakeholders should implement state of the art supervision in their processes so that the stakeholders understand the functioning of the software before it is rolled out.

FIA: We fully support any efforts to make AI transparent to the consumer/user of the vehicle. At the driver's request, this information should be available in the vehicle depending on the situation, e.g. for actions that the vehicle performs independently from the driver.

Different drivers / different owners should be able to "reset" the AI learning