

Legal Framework for Autonomous Vehicles in EU and Croatia

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Abstract - Current legal framework for autonomous vehicles is based on Vienna convention in 1968 that authorises the uses of "self-driving" technology under certain conditions, but requires the presence of a human driver that can take control of the vehicle at any time. In the meantime, the AI technology has become so developed, that the best chess programs are practically unbeatable for human players. Those programs are based on neural networks and training methods that largely depend on the quality of data. The approach to collecting data can be varied. The concept of criminal responsibility is dependent on the awareness of the criminal responsibility, that is usually assumed for humans. In the case of AI, it can not be aware in the human sense, and it evaluates situations in its own terms. It could be licensed as a European product, however, it AI can not really be classified just as a 'product', which means that commercial law should also be improved. The aim of this paper is to assess the suitability of Croatian legal system to be the first to regulate AI for completely autonomous vehicles in the EU, in order to establish a model for this regulation on the EU level. Such a role for Croatia has been proposed, as the Croatian company Rimac Automobili should be the first to produce such a vehicle, and therefore Croatia should be able to provide legal framework for this.

Key words – autonomous vehicles, EU law, comparative law, comparative legal systems, legal framework, AI

I. INTRODUCTION

An automated vehicle is a motor vehicle that has technology designed to assist the driver, so that the elements of the driving task can be transferred to a computer system. An autonomous vehicle is a fully automated vehicle equipped with the technologies capable of performing all driving functions without the human intervention. The Society of Automotive Engineers (SAE) has proposed a six-level classification of road vehicles from Level 0 (no automation) to Level 5 (full automation). In this paper we will consider only Level 3 (conditional automation), Level 4 (high automation) and Level 5 (full automation). Those systems are not yet commonly used. Systems under level 4 do not require a human driver to take over the control in appropriate reaction time, as the automated mode is still active while the driver performs secondary actions, even with a long reaction time. On the other hand, Level 5 systems are designed to autonomously complete journeys without the need of a human driver, and are a completely self-driving vehicles.[7]

TABLE 1 SAE LEVELS AND THEIR DESCRIPTION

SAE level	Description of the level		
	Type of automation	Functions	Driver
Level 0	No automation	None	required
Level 1	Driver assistance	Single automated system for assistance	required
Level 2	Partial dr. automation	ADS performs all aspects of driving	Required to intervene
Level 3	Conditional automation	ADS performs entire DDT within ODD	Fallback ready user
Level 4	High driv. automation	ADS performs entire DDT and fallback on a sustained and ODD specific basis	No expectation of user intervention
Level 5	Full driv. automation	ADS preforms entire DDT and fallback on a sustained and unconditional basis	Not expected to intervene

ADS (ADAS) are advanced driving-assistance systems that can perform DDT (dynamic driving tasks) within their ODD (operational design domain), and in case of fallback of DDT, a human user (driver) may be expected to intervene. Dynamic driving tasks are all the real-time operational and tactical functions required to operate a vehicle in on-road traffic within its operational design domain, excluding strategic functions, such as trip scheduling and selection of destinations and waypoints. Operational design domain are operating conditions under which a given driving automation system or feature thereof is specifically designed to function. [7]

The legal framework for autonomous mobility in the EU is a subject of a lot of controversy. It is an area where the EU has shared competencies with member states, namely countries exercise their competence where the EU does not, or has abstained from it. The Commission has adopted a strategy paper On the road to automated mobility: an EU strategy for mobility of the future, as a part of Commissions third mobility package. Most recently, it has made a new piece of legislation and presented it to the EP.

Vienna Convention on Road Traffic of 1968[22] is an international treaty that facilitates international road traffic and increases road safety by establishing standard traffic rules among the contracting parties. All EU member states are signatories of the Vienna Convention, except Spain.

One of the fundamental principles, as laid in Article 8, is that a driver is always fully in control. Article 8 (1) Every moving vehicle or combination of vehicles shall have a driver and Article 8 (5) Every driver shall at all times be able to control his vehicle. An amendment to the Convention was made in 2014, stating that "systems which influence the way vehicles are driven", as well as other systems, which can be overridden or switched off by the driver, are deemed to be in accordance with Article 8. Nevertheless, to allow for completely self-driving vehicles without a driver, a further amendment process is needed.

A legislative framework in the EU does not exist, however the existing EU legislation is already suitable for automated and connected vehicles. The Directive 2007/46/EC, modernized in 2018 and applicable from September 1 2020, regulates how vehicles should operate and be designed. On the March 2019, Commission published a delegated regulation for deployment of Cooperative Intelligent Transport Systems (C-ITS) on roads, connecting all road users and traffic managers so that they can share and use information in real time. It requires vehicles, traffic signs and motorways to be equipped with technology to send standardized messages to all traffic participants surrounding them. [2]

1) National level

At the national level, legal frameworks are varied, which may lead to better or worse development of autonomous cars, depending on how much experimenting is allowed, but also on how much legal certainty is achieved.[10] Different countries have introduced measures to ease tests of autonomous vehicles on their roads or have clarified the regulatory context to allow for tests. Sweden, Germany, France and Belgium have different requirements. Germany has recently passed a law on autonomous driving, which entered into force on July 28, 2021, and amended the German Road Traffic Act (Strassenverkehrsgesetz – StVG), German AD law, to allow for level 4 ISO/SAE to be used in regular operation in defined operating areas. This law no longer requires a driver and intends to allow "autonomous driving functions" in such operations. The law will be supplemented by an ordinance, which will provide requirements for national approval of vehicles with autonomous driving functions (ordinance implementing the law amending the Law Traffic Road Act). The ordinance uses the term 'vehicle manufacturer', that is similar to the understanding of the term manufacturer used under Regulation (EU) 2018/858, which means that it is the a person that proves to the KBA (German Federal Motor Transportation Authority) that it is responsible for the type-approval procedure and for the conformity of production and has taken necessary precautions, but it is not required that the manufacturer is the actual producer or 'vehicle manufacturer'. This may have implications on the possibility of testing new vehicles (whether the term used is just 'manufacturer' or 'vehicle manufacturer'). The France has allowed for more flexibility with a Decree for automated vehicles' conditions of use and automated road transport systems' commissioning (Decree No. 2021-873 of June 29, 2021).ARTS are defined as a set of highly or fully automated vehicles and technical installations allowing remote intervention or participating in safety

deployed on predetermined routes or areas, and supplemented with operating, upkeep and maintenance rules, for providing a road transport passenger service. This approach breaks away from the traditional approval concept and allows for new automated vehicles to be tested in predetermined zones or roads. The Netherlands has introduced Dutch Experimental Law on July 1, 2021, to allow for more flexibility in testing automated cars, defined as 'connected automated vehicles'. Great Britain has introduced the concept of "automated driving system entity" (ADSE)[5]

2) Draft EU ADS Regulation

Recently published Regulation represents a step towards harmonizing type-approval regulations for autonomous vehicles across EU Member States, allowing for regulatory certainty that will help foster innovation. It is the implementing Regulation for the Regulation (EU) 2019/1944, EU General Safety Regulation (GSR), as regards uniform procedures and technical specifications for the type-approval of motor vehicles with regard to their ADS. It clarifies the definition of the term 'manufacturer' from the Regulation (EU) 2018/858, by a newly added reference, whereas at first the term was used inconsistently and interchangeably with the 'vehicle manufacturer', by referring explicitly to the term used in Article 3 (40) of the Regulation (EU) 2018/858 and deleting the term "vehicle manufacturer" from several instances. This makes clear that any entity suitable and willing to prove responsibility and expertise toward the authorities may submit an ADS for type-approval.[5] There may also be some regulation specific to cities, especially concerning ADS or black box incident recording.[8]

II. METHODOLOGY AND PROPOSED ANALYSIS

1) Comparative analysis of Croatian and EU legal systems,

Croatian legal system is predominantly rule-based in comparison with continental legal system, which may be considered as principle-based. Anglo-Saxon legal systems, as in UK and US, are similar to Croatian in that they are rule based, but depend mostly on excellent judiciary and the system of legal precedents (case law), whereas Croatian system depends on Acts and sublegal norms (*podzakonski akti*), such as regulations (*propisi*) and other administrative acts that are passed by the administration. The EU legal system consists of legal norms that are obligatory for all EU members, but may be directly applicable (Regulations) or require transposition into national law. The problems may arise when Acts are harmonized with the EU law, but the sublegal acts are not harmonized with the law, or there are problems with the exact interpretation of the law or in harmonization with other Acts in the national legal system, which can happen by overlooking such problems or by accident, or perhaps intentionally. This is what is usually accomplished in systems that are more principle based, with laws that are more general and abstract in nature. [1] However, in Croatian system, which is more rule-based, it is sublegal norms made by administration (ministries) that are usually applied and enforced, whereas Acts which are more general and harmonized with the EU Acquis are not

enforced, as this would require better evaluation of situations by the administration itself, not to mention the judiciary. As in the case of safety and security of international trade, the difference between the EU and US law is that the first is more abstract and general, allowing for more discretionary power and interpretation in the case of AEO (authorized economic operator) than in US customs regulations (C-TPAT). The problems are then solved by case law, and the Supreme Court of the Republic of Croatia (Vrhovni sud) has the role in the system that should harmonize the standards by which the laws are applied. However, the system of legal revision is not a strong mechanism, as only 10% or fewer revisions ever become accepted by the Supreme court, and the rest of them are rejected without review or deemed unacceptable. Therefore it is possible to have a 'completely harmonized' legal system in some field of law, and still not be able to obtain adequate level of equality in the application between EU law and national Croatian law.

The problem with the law that should govern autonomous vehicles arises as Croatia should now be the first EU member country to propose a legal solution for level 5 autonomous vehicles, which means that this legal solution (Act) should be transposed and harmonized with other EU laws regarding this matter. One possibility is that Croatian law would draw heavily on German law that is very advanced in this matter and other better advanced laws, and the subsequent EU Regulation or Directive would be based on this. [5]

Our analysis should therefore use the following methodology: we should analyze the existing Croatian law, the new Act on Traffic Safety which is being currently proposed, and compare it to the existing laws in Germany and other countries, as well as the EU law, and from this we shall deduce how applicable this Act could be on the level of the whole EU of it ever becomes an EU Regulation or a Directive.

2) *A comparative analysis of the Croatian law and EU law governing traffic safety and autonomous vehicles*

Law governing traffic safety is a typical example of a rule based law, where regulations prescribe how to behave in detail. You either drive 120 kph or you don't. If you drive faster, you may be fined, and if you don't you can't. The provisions of this law are not so much based on principles at a first glance. However, this is not so simple. First, legal systems are not completely rule based or principle based, but are somewhere in between. This classification is useful only for orientation purposes. The traffic law, or for example, law governing transport of dangerous materials must be frequently changed and adjusted with the EU law, but if the sublegal acts are not changed, no effect shall be guaranteed. Finally, the enforcement of the law depends crucially on the quality of administration, in this case of the traffic safety on the police, so the impact of laws is heavily dependent on the quality of the administration (the police) that has to enforce it. On the level of member states, implementation of laws may differ, so different laws may have similar effect, just as similar laws may have different effects in

different countries. All these elements should be taken into consideration, if we want to obtain the uniform application of law in all EU member states as well as within individual EU member states.

In this case we shall analyze Croatian Act on Traffic Safety and its amendments, and how they could be harmonized with the EU law governing the same matter, and taking it further towards level 5 for completely autonomous vehicles.

III. CROATIAN TRAFFIC SAFETY ON THE ROADS ACT (CTSRA) AND ITS EU COUNTERPARTS

New amendments of the CTSRA of November 11, 2021, are based on the constitution, Article 2, paragraph 4, subparagraph 1 of the Constitution of the Republic of Croatia. The reason for this novel approach is the growing number of unregulated electric vehicles in traffic, and the fact that so far people riding electric bikes, scooters or segways were considered pedestrians. In this new version of the Act, new categories of vehicles are added, which also includes autonomous electric vehicles (without the need for a driver). For the sake of balance, probably, the horseback riders were also added, which were previously unregulated. The Act has taken into consideration how this matter was regulated in other EU countries, among which some have moved the jurisdiction to the local governments, or cities, instead of leaving it to the police. For instance, in Belgium scooters are treated as bicycles, in the same category, whereas in Great Britain and Ireland they are categorized as motor vehicles, with considerably larger fines for misconduct. In Germany, the maximum speed of electric scooters is limited to 20 kph, no driving license is required and the minimum age of drivers is 14 years. In France, there is a specific category "personal motor electric mobile devices", which is strictly regulated. The speed is limited to 25 kph, and they are allowed only on defined bicycle tracks, not on ordinary roads for vehicles or in pedestrian zones, or on roads where the speed is limited to 50 kph. No earphones are allowed and only one person may ride such a vehicle. The fines from 135 to 1500 euros are also provided, as well as 35 euros for parking in pedestrian zones. Caskets and reflecting suits are also obligatory. However, in Italy they are allowed to drive on pedestrian zones and ordinary roads as well. In Norway and Sweden, they are treated as bicycles, but Sweden prohibits speeds greater than 20 kph on bicycle tracks (routes). In Spain, maximum speed depends on whether roads, bicycle tracks or pedestrian zones are used for driving. Cities may pass their own regulations regarding this. The insurance against third parties is required. [3] This shows how different this treatment can be among different countries and that it largely depends on typization (categorization) of vehicles, in legal acts and what type of responsibility is therefore deduced for drivers. In a typical situation, the responsibility for accidents is shared among drivers, car manufacturers and traffic regulators, where insurance can deduce who is responsible for what part of the damage, or things can be settled at court. However, in

the case of completely autonomous vehicles, where there are no drivers or they are not expected to intervene, a completely new category is required, in which the responsibility would be shared among the producer and other actors, but not the driver (as there would be none), so these vehicles would be required to have a 'black box', similar to those that are fitted in airplanes. Thus it is possible to determine the responsibility of the manufacturer in the case of insufficiently mature (tested) autonomous vehicles, where it is difficult for a victim to prove defects and causality of a highly sophisticated autonomous cars.[20] Apparently, this has not yet been provided for in the new CTSRA, so we are eager to see how this will be put into legal text and if there will be some similarities to the air traffic laws. So far, we could predict a much larger role of controlling mechanisms that would take the full responsibility for vehicles, and the possibility of hacking should not be underestimated, so the AI would have to be well equipped to deal with such possibilities (e.g. hacking of sensors etc).

Additionally, we should mention several sublegal acts (ordinances, regulation books, etc. - *pravilnik*) that are yet to be taken into account and harmonized eventually when the CTSRA changes sufficiently to actually better define autonomous vehicles and allows for their testing on the roads: Regulation book on Determining Conformity of Motor Vehicles / *Pravilnik o utvrđivanju sukladnosti motorovnih vozila i njihovih prikolica*, Regulation book on Determining Conformity of vehicles on two or three wheels, Regulation book on Determining Conformity of tractors for Agriculture and Forestry, Regulation books and Ordinances on Homologation, which may be important for determining categories vehicles (types) for homologation (determining conformity to the standard and type-approval).

IV. IS THIS CATEGORISATION ADEQUATE?

When taking into account whether it is sufficient to regulate only one type of autonomous vehicle, it would not be without reason to specify special characteristics of those vehicles. For instance, currently two types of autonomous vehicles are being built: one type is mostly dependent on sensors that are external to the vehicle, such as road sensors, and they form the basis for the teaching AI how to behave, and the other type is the vehicle that is dependent mostly on its own sensors 'like and animal is', such as Tesla car. It would seem that this second approach offers more possibilities in terms of avoiding hacking, but it would also present specific risks in terms of relying completely on AI to behave better than an average driver would. In this case, a comparison with a horseback rider comes to mind, as the horses, even when they are well trained can become unpredictable or move uncontrollably, and so it could be expected that such problems with Tesla cars or any similar "animalistic" autonomous vehicles would have to be solved before claiming that the level 5 autonomy has been achieved. It is also unclear whether higher level of automation is

necessarily better, as level 4 cars could easily outperform potential level 5 vehicles, despite being less automated. The reason for introducing new types of vehicles should certainly be in their ability to outperform human operators, something that chess AI has done for decades.

V. THE REASONING BEHIND THE NEW ACT

It is clear that regulation is necessary, if there are new types of vehicles involved. However, it is E: precisely the lack of complex regulation that enables experimenting and invention. For instance, IT sector is among most propulsive and innovative sectors in Croatia, mostly due its lack of regulation. If it were more heavily regulated (or if it were possible, due to quick and abrupt changes in technology), it would be more restricted and slow in innovation. As for autonomous cars, the risk for human lives requires that this sector be more heavily regulated, while on the other hand it should preserve its ability to innovate. It may be argued that in Croatia, due to rather large number of traffic accidents with a lot of casualties and damage, the use of AI in driving autonomous vehicles is well justified, although this argument in favor of autonomous vehicles may be also controversial if alternative approaches are not taken into consideration[12]. The poor quality of human drivers, despite extensive regulation for driving schools and other experts in the field shows that it would not be long before AI driven vehicles show sufficient improvement to outperform human drivers, which would then be prohibited to drive. The movement in this direction can already be seen with the provision that ordinary MD, or the "primary physicians" may report on drivers if they decide they are not sufficiently fit to drive, so that their drivers licenses could be revoked.[3] It may even be regarded as an attack on the privacy of drivers or an unduly requirement for physicians to report on their patients as ordinary 'snitches', but in the long run it may be the road to the improvement of performance on the road, where the role of AI in driving will become more and more prominent. It may also be noted that in Croatian case law accidents are usually defined as a 'forbidden effect', but the actual cause is seldom determined, not to mention the objective guilt of the perpetrator to the victim,[21] and it may be expected that the same problem could arise with respect to the autonomous car manufacturers in Croatian courts. On the other hand, with respect to testing, such an attitude could lead to more flexibility, thus enabling better opportunities for autonomous car development then in some other EU countries.

VI. CONCLUSION

We have compared Croatian law on Traffic Safety with other similar national laws in the EU and the EU law, and have detected problems that may arise from insufficient precision of the transposition of Croatian law into the EU system, due to inherent differences of those systems, and on the other hand excessive precision that may become a burden when law should refer to the general principles. This problem should be resolved by

legal experts that are well versed in both legal systems, or with extensive knowledge of comparative legal systems, in order to overcome the difficulties when drafting law on the EU level on the basis of Croatian law. It should be noted that Croatian law has merely introduced the new category of vehicles, but has not yet harmonized it with any EU regulations, or provided any direction to which this harmonization should go. It may well follow German example, or allow for more flexibility in testing.

REFERENCES

- [1] B. Burgmeestre, J. Hulstijn, Z.-H. Tan, Rule Based versus Principle Based Regulatory Compliance, Conference paper, www.researchgate.net/publication/220809898
- [2] European Commission, Directive 2007/46/EC
- [3] *Zakon o sigurnosti prometa na cestama* (Traffic Safety on the Roads Act), amendments (2022)
- [4] Draft EU ADS Regulation
- [5] Hogan Lowells White Paper: The Road to Autonomous Vehicles, October 2021.
- [6] A.I.Lewis, E. Lostri, C. Chang: AI Strategies and Autonomous Vehicles Development, in :Center for Strategic and International Studies, April, 2021
- [7] Society of Automotive Engineers (SAE), Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles, 2021, J3016_202104, www.sae.org/standards/content/j3016_202104/
- [8] D. Ticoll, Driving Changes, Automated Vehicles in Toronto, October 2015.
- [9] A. Faisal, MD Kamruzzaman, T.Yigitcanlar, G. Currie, Understanding autonomous vehicles: A systematic literature review on capability, impact, planning and policy, *Journal of Transport and Land Use*, Vol. 23, No1 (2019), pp. 45-72
- [10] J.S. Brodsky, Autonomous Vehicle Regulation: How an Uncertain Legal Landscape May Hit the Brakes On Self-Driving Cars, *Berkeley Technology Law Journal*, Vol. 31, No2, Annual Review (2016=, pp. 851.878.
- [11] P. Koopman, M. Wagner, Challenges in Autonomous Vehicle Testing and Validation, *SAE International Journal of Transportation Safety*, Vol. 4, No1 (April 2016), pp. 15-24
- [12] D.E: Bailey, I. Erickson, Selling AI: The Case of Fully Autonomous Vehicles, *Issues in Science and Technology*, Vol. 35, No. 3 (Spring 2019), pp. 57-61
- [13] D.P.Ljungholm, Autonomous Car Regulation in the Smart Transportation Infrastructure: Ethical Issues, Legal Liabilities, and Privacy Concerns, *Geopolitics, History and International Relations*, Vol. 11, No. 2 (2019), pp.7-12
- [14] J.M. Anderson, N.Kalra, K.D: Stanley, P. Sorensen, C. Samaras, O. A. Oluwatola, from: *Autonomous Vehicle Technology, A Guide for Policy makers*, RAND Corporation (2014), pp. 97.110
- [15] K.S. Abraham, Automated Vehicles and Manufacturer Responsibility for Accidents: A New Legal Regime for a New Era, *Virginia Law Review*, Vol. 105, No. 1 (March 2019), pp. 127-171
- [16] N. Kalra, S.M. Paddock, Driving to Safety: How Many Miles of Driving Would It Take to Demonstrate Autonomous Vehicle Reliability, pp. 1-15, RAND Corporation, 2016
- [17] C. Barnard, Restricting Restrictions: Lessons for the EU from the US?, *The Cambridge Law Journal*, Vol. 68, No. 3)Nov., 2009), pp. 575-606
- [18] R. de Bruin, Autonomous Intelligent Cars on the European Intersection of Liability and Privacy: Regulatory Challenges and the Road Ahead, *European Journal of Risk Regulation*, Vol. 7, No. 3)2016), pp. 485-501
- [19] K. Noussia, Autonomous Vehicles: Legal Considerations and Dilemmas, in: *InsurTech: A Legal and Regulatory View* (pp. 253-270).
- [20] Y. Sun, Construction of Legal System for Autonomous Vehicles, Conference: 4th International Conference on Culture, Education and Economic Development of Modern Society (ICCESE 2020). , Wuhan University of Technology, Wuhan, China
- [21] Dr. sc. Zlatan Dežman, Kaznenopravna zaštita cestovnog prometa prema KZ Slovenije I KZ Hrvatske, *Izvorni znanstveni rad*, UDK 343.346 (497.4)
- [22] Vienna Convention on the Law of Treaties, <https://legal.un.org>