DISCUSSION

INVESTIGATING ACCIDENTS OF AUTONOMOUS VEHICLES FROM THE PERSPECTIVE OF INTELLECTUAL PROPERTY PROTECTION

Alžběta Krausová[*,1]

Abstract: *Autonomous vehicles are equipped with advanced hardware and software components that are protected with different intellectual property rights. In case of an autonomous vehicle accident, investigators can examine the vehicle data, the technical condition of sensors, and the proper functioning of the involved systems. However, detailed inspection of the technology and public hearings examining individual functionalities might interfere with autonomous car producers' strategies of intellectual property protection. The paper determines whether and under which circumstances such an investigation of autonomous vehicle accidents can interfere with the legitimate interests of car producers in the area of intellectual property protection and what might be the potential solutions to this problem. The paper focuses primarily on Czech and EU law.*

Keywords: *accident, autonomous vehicle, data sharing, intellectual property, investigation, patent, trade secret*

INTRODUCTION

Autonomous vehicles are presumed to be the future of our transportation and should contribute to increasing safety on the roads. As opposed to conventional cars, automated[2] and autonomous vehicles[3] are equipped with additional advanced hardware and software

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[2] *Automated vehicles* are defined as motor vehicles "designed and constructed to move autonomously for certain periods of time without continuous driver supervision but in respect of which driver intervention is still expected or required." See Art. 3 (21) of the Regulation (EU) 2019/2144 of the European Parliament and of the Council of 27 November 2019 on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users, amending Regulation (EU) 2018/858 of the European Parliament and of the Council and repealing Regulations (EC) No 78/2009, (EC) No 79/2009 and (EC) No 661/2009 of the European Parliament and of the Council and Commission Regulations (EC) No 631/2009, (EU) No 406/2010, (EU) No 672/2010, (EU) No 1003/2010, (EU) No 1005/2010, (EU) No 1008/2010, (EU) No 1009/2010, (EU) No 19/2011, (EU) No 109/2011, (EU) No 458/2011, (EU) No 65/2012, (EU) No 130/2012, (EU) No 347/2012, (EU) No 351/2012, (EU) No 1230/2012 and (EU) 2015/166 (Text with EEA relevance). In: *EUR-Lex* [online]. 16. 12. 2019 [2022-05-15]. Available at: <https://eur-lex.europa.eu/eli/reg/2019/2144/oj>.

[3] In the legal terminology, the term autonomous vehicle is replaced by the term *fully automated vehicle*. It refers to "a motor vehicle that has been designed and constructed to move autonomously without any driver supervision." See Art. 3 (22) of the Regulation (EU) 2019/2144 of the European Parliament and of the Council of 27 November 2019 on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users.

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components. These components provide drivers with new functionalities such as intelligent speed assistance, driver drowsiness and attention warning, advanced driver distraction warning, or an emergency lane-keeping system. The hardware and software technologies are usually new and are protected by a number of patents as well as other means of intellectual property protection. This fact alone is supposed to cause a large increase in intellectual property lawsuits in relation to autonomous vehicles.[4] Moreover, these technologies process large amounts of data, store them, and are presumed to share them with car manufacturers, systems of smart infrastructure, or other nearby vehicles.

Even though autonomous vehicles are presumed to be safer one day than regular cars, there have already been several cases of accidents involving autonomous vehicles.[5] Some of those accidents, unfortunately, involved fatalities as well.[6] Investigating accidents of autonomous cars will be most likely, to a certain degree, different than investigating accidents of regular vehicles since the new type of vehicles produces large volumes of data that can be used to determine the cause of an accident. This has been reflected in proposals on how to investigate accidents of autonomous vehicles.[7] In the Czech Republic, a new methodology for detecting crimes within the road transportation system based on electronic accident data was developed.[8]

Processing and investigation of voluminous data shall contribute to greater certainty about the cause of car accidents and, thus, a fair determination of liability. An investigation can, however, involve not only the vehicle data but also an examination of the technical condition of sensors or the proper functioning of involved systems. On one hand, it is in the public interest to rigorously investigate and determine the cause of an accident in order to prevent future accidents. On the other hand, detailed inspection of the technology and public hearings examining individual functionalities might interfere with autonomous car producers' strategies of intellectual property protection or even endanger their legitimate interests.

With regard to the suggested problem, this paper aims to determine whether and under which circumstances an investigation of autonomous vehicle accidents can interfere with

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[4] KANTNER, R. W. New Intellectual Property Considerations and Risks for Autonomous Vehicles. In: *Jones Day* [online]. 2017 [2021-02-14]. Available at: <https://www.jonesday.com/en/insights/2017/05/new-intellectual-property-considerations-and-risks-for-autonomous-vehicles>.

[5] See for instance PETROVIĆ, Đ., MIJALOVIĆ, R., PEŠIĆ, D. Traffic Accidents with Autonomous Vehicles: Type of Collisions, Manoeuvres and Errors of Conventional Vehicles' Drivers. *Transportation Research Procedia*. 2020, Vol. 45, p. 161-168, [2022-05-15]. Available at: <https://doi.org/10.1016/j.trpro.2020.03.003>.

[6] Some cases are described in KOPESTINSKY, A. 25 Astonishing Self-Driving Car Statistics for 2022. In: *Policy advice* [online]. 5. 3. 2022 [2022-05-15]. Available at: <https://policyadvice.net/insurance/insights/self-driving-car-statistics/>.

[7] See VIRGINIA TECH TRANSPORTATION INSTITUTE. Law Enforcement, First Responder and Crash Investigation Preparation for Automated Vehicle Technology. In: *GHSA* [online]. 2021 [2022-05-15]. Available at: <https://www.ghsa.org/sites/default/files/2021-09/Law%20Enforcement%2C%20First%20Responder%20and%20Crash%20Investigation%20Preparation%20for%20Automated%20Vehicle%20Technology%20FINAL.pdf>; orYUAN, Q., PENG, Y., XU, X., WANG, X. Key points of investigation and analysis on traffic accidents involving intelligent vehicles. *Transportation Safety and Environment*. 2021, Vol. 3, No. 4, [2022-05-15]. Available at: <https://doi.org/10.1093/tse/tdab020>.

[8] For details and results of a specialized research project see The Development of Innovative Method for Detection of Crimes Within Road Transportation System Using Electronic Accident Data. In: *STAFROS* [online]. 14. 6. 2021 [2022-05-15]. Available at: <https://starfos.tacr.cz/en/project/VI20172020108#project-main>.

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the legitimate interests of car producers in the area of intellectual property protection and what might be potential solutions to this problem. The paper focuses primarily on Czech and EU law. It firstly describes the manners of intellectual property protection. Next, the paper focuses on the methodologies for investigating autonomous vehicle accidents. Consequently, the paper examines how intellectual protection can be affected in the process of accident investigation. Lastly, the paper provides several recommendations on what could be done to solve the identified problems.

I. INTELLECTUAL PROPERTY PROTECTION OF AUTONOMOUS VEHICLES

In order to function without a driver, fully autonomous vehicles are equipped with a number of technologies. In principle, their systems consist of the following main subsystems:[9] *a subsystem for perception* based on data collected from various sensors;[10] *a subsystem for decision-making* that involves behavior planning and is typically based on various algorithms, including artificial intelligence; and *a subsystem for controlling and manipulating the vehicle* with the help of various components, such as an engine, breaks, a steering wheel, etc. Sensors are the main source of data that is consequently processed by various algorithms, such as algorithms for object detection, object tracking, localization, mission planning, motion planning, and path following.[11]

From the perspective of the intellectual property (hereinafter "IP") protection, both the hardware (sensors) and the software (algorithms) components can be protected by different rights. In general, the most used types of IP protection for components of autonomous vehicles are patents, trade secrets, and copyright.[12] Each of the rights has advantages and disadvantages which need to be considered when making an individual IP protection strategy.

Patents are a very strong type of IP protection. One of their advantages is that they are made public. A technological solution that they present cannot be used by another person within the territorial scope of a respective patent unless licensed by a patent holder. On the other hand, not every technology can be patented,[13] the validity of a patent is limited,

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[9] SHI, W., ALAWIEH, M. B., LI, X., YU, H. Algorithm and hardware implementation for visual perception system in autonomous vehicle: A survey. *Integration*. 2017, Vol. 59, p. 148–156 [2022-05-15]. Available at: <https://www.sciencedirect.com/science/article/pii/S0167926017303218>.

[10] Examples of typical sensors are "cameras, lidar, radar, sonar, a global positioning system (GPS), an inertial measurement unit (IMU), and wheel odometry". See KOCIĆ, J., JOVIČIĆ, N., DRNDAREVIĆ, V. Sensors and Sensor Fusion in Autonomous Vehicles. In: *ResearchGate* [online]. 19. 2. 2019 [2022-05-15]. Available at: <https://www.researchgate.net/profile/Jelena-Kocic/publication/329153240_Sensors_and_Sensor_Fusion_in_Autonomous_Vehicles/links/5c6c65c692851c1c9dee9030/Sensors-and-Sensor-Fusion-in-Autonomous-Vehicles.pdf>.

[11] KATO, S., TAKEUCHI, E., ISHIGURO, Y. et al. An Open Approach to Autonomous Vehicles. *IEEE Micro*. 2015, Vol. 35, No. 6, [2022-05-15]. Available at: <https://ieeexplore.ieee.org/document/7368032>.

[12] KELLER, P., WILPON, A. Obstacles in the Road: The Multi-Faceted Approach to IP Protection in the Autonomous Vehicle Sector. *RAIL: The Journal of Robotics, Artificial Intelligence & Law*. 2018, Vol. 1, No. 6, pp. 357–370, [2021-02-13]. Available at: <https://heinonline.org/HOL/P?h=hein.journals/rail1&i=370>.

[13] Patent laws have strict conditions on patentability of technical solutions. With regard to autonomous vehicles, in Europe, software is in general excluded from patentability. However, it is possible to obtain a patent for a computer-implemented method.

and the cost of acquiring a patent can be quite high. Patents are widely used in the autonomous vehicles industry.[14] In the United States, there have already been patent litigations, for instance, between Waymo and Uber.[15]

As opposed to patents that are made public, *trade secrets* are based on keeping valuable information confidential. The EU law defines a trade secret as "information which meets all of the following requirements: (a) it is secret in the sense that it is not, as a body or in the precise configuration and assembly of its components, generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question; (b) it has commercial value because it is secret; (c) it has been subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep it secret."[16] Trade secrets can cover a broader spectrum of information than patents. Their validity is not limited in time, and the cost can be much lower than a patent. Trade secrets can protect algorithms that are excluded from protection by patents or by copyright.

In this context, it is worth noting that patents and trade secrets do not automatically exclude one another. It is possible to combine patent protection that discloses the "best mode" of technical solution with a trade secret that covers other modes of utilizing the solution, such as additional use of algorithms that can stay secret.[17]

Copyright protection under the Czech law covers a work "that is a unique result of the author's creative activity and is expressed permanently or temporarily in any objectively perceptible form, including an electronic form, regardless of its scope, purpose, or significance."[18] It is mainly relevant for the protection of computer programs (not algorithms) and databases. Copyright protection is automatic, does not require any registration or any procedure to keep information secret, and provides relatively long protection.[19]

From the perspective of autonomous vehicle accident investigation, the most interesting type of IP protection is trade secret.

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[14] EPO. Patents and self-driving vehicles. The inventions behind automated driving. In: *European Patent Office* [online]. 2018 [2022-05-15]. Available at: < https://www.epo.org/news-events/news/2018/20181106.html>.

[15] See GORELIK, I. Resolving Self-Driving Car Patent Conflicts: Arbitration in Waymo v. Uber and Future Autonomous Vehicle Patent Disputes. *Cardozo Journal of Conflict Resolution.* 2018, Vol. 20, No. 1, pp. 229-[vi], [2021-02-13]. Available at: <https://heinonline.org/HOL/P?h=hein.journals/cardcore20&i=235>; or MARGULIS, C., GOULDING, C. Waymo vs. Uber May Be the Next Edison vs. Westinghouse. *Journal of the Patent and Trademark Office Society.* 2017, Vol. 99, No. 3, pp. 500-524, [2021-02-13]. Available at: <https://heinonline.org/HOL/P?h=hein.journals/jpatos99&i=522>.

[16] Art. 2(1) of Directive (EU) 2016/943 of the European Parliament and of the Council of 8 June 2016 on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure (Text with EEA relevance). In: *EUR-Lex* [online]. 15. 6. 2016 [2022-05-15]. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016L0943&qid=1653245769515>.

[17] KELLER, P., WILPON, A. *Obstacles in the Road: The Multi-Faceted Approach to IP Protection in the Autonomous Vehicle Sector.* p. 366.

[18] See § 2 (1) of the Act No. 121/2000 of the Coll. on Copyright, on Rights Related to Copyright and on the Amendment of Certain Laws (Copyright Act).

[19] Under the Czech law, economy rights related to copyright are protected for the period of author's lifetime and 70 years after the author's death.

II. LEGAL FRAMEWORK FOR INVESTIGATING ACCIDENTS OF AUTONOMOUS VEHICLES

Studies show that autonomous vehicles are typically involved in accidents where there is a "rear-end" collision.[20] However, there have been also collisions with pedestrians or some barriers. Under the Czech law, an accident is defined as "an incident on the road, such as a crash or collision that has occurred or started on the road, resulting in death or personal injury or property damage in the direct connection with the operation of the vehicle in motion."[21]

When such an accident occurs, the Czech Police is obliged to investigate the accident. The Police follows a standard criminological methodology.[22] In general, the Police examines the surroundings of the accident, as well as the vehicle and the state of injured people.[23] With regard to autonomous vehicles, it is important to follow a special procedure when investigating the vehicle and securing the data from the vehicle.[24] It is important that the vehicle data will not be manipulated before the Police will download them. The download can be done only with a specific device and performed for example by a producer, a criminalistics technician, a forensic expert, or another person who possesses the necessary device. If data cannot be secured at the place of an accident, the vehicle is transported to a location where all the necessary steps can be performed.[25] The data will be used as an evidence for investigating potential criminal offence according to the Criminal Code[26] and Criminal Procedure Code.[27] Moreover, the Police can also investigate other functionalities of a vehicle in case they suspect these might contribute to the accident. This will be most probably a case of autonomous vehicle accident.

According to the Czech methodology on detecting crime from vehicle data,[28] it will be necessary to examine not only vehicle data but also safety of the whole system of au-

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[20] See PETROVIĆ, Đ., MIJALOVIĆ, R., PEŠIĆ, D. *Traffic Accidents with Autonomous Vehicles: Type of Collisions, Manoeuvres and Errors of Conventional Vehicles' Drivers*; or FAVARO, F. M., NADER, N., EURICH, S. O. TRIPP, M., VARADARAJU, N. Examining accident reports involving autonomous vehicles in California. *PLOS One*. 2017, [2022-05-15], Available at: <https://doi.org/10.1371/journal.pone.0184952>.

[21] See § 47 (1) of the Act No. 361/2000 of the Coll., on Traffic on Roads and on Amendments to Certain Acts (Road Traffic Act).

[22] VOKUŠ, J. Vyšetřování dopravních nehod. In: *Policie České republiky* [online]. 2. 6. 2015 [2021-02-13]. Available at: <https://www.policie.cz/clanek/vysetrovani-dopravnich-nehod.aspx>; or Závazný pokyn policejního prezidenta č. 160/2009 ze dne 4. prosince 2009, kterým se upravuje postup na úseku bezpečnosti a plynulosti silničního provozu. In: *Policie České republiky* [online]. 25. 7. 2014 [2021-02-13]. Available at: <https://www.policie.cz/clanek/zverejnene-informace-2014-bezpecnost-a-plynulost-silnicniho-provozu.aspx>.

[23] See for instance JŮN, M. *Metodika vyšetřování silničních dopravních nehod. Methods of Road Accidents Investigation.* Praha, 2021. Diploma thesis. Vysoká škola finanční a správní. Available at: <https://is.vsfs.cz/th/wnowm/Diplomova_prace_Metodika_vysetrovani_silnicnich_dopravnich_nehod.pdf>.

[24] KOMÁREK, J. et al. Inovativní metoda k odhalování trestných činů v silniční dopravě s využitím elektronických nehodových dat. In: *ČVUT* [online]. 2020 [2022-05-15]. Available at: <https://k622.fd.cvut.cz/downloads/Inovativn%C3%AD%20metoda.pdf>.

[25] Ibid., p. 21.

[26] Act No. 40/2009 of the Coll., Criminal Code.

[27] Act No. 141/1961 of the Coll., on Criminal Procedure (Criminal Procedure Code).

[28] KOMÁREK, J. et al. *Inovativní metoda k odhalování trestných činů v silniční dopravě s využitím elektronických nehodových dat.* p. 57–58.

tonomous driving in order to determine potential liability of a vehicle producer. During the investigation, the producer may be asked to provide evidence on compliance with legal requirements, while the evidence can be protected either by patents or, more probably, by trade secrets.

III. IMPACT OF ACCIDENT INVESTIGATION ON IP PROTECTION

During the investigation of autonomous vehicle accident, Police as well as insurance companies will examine information that can be covered by IP rights. The information will be considered as evidence and will be made public within a court hearing. Moreover, it will be accessible also in the court file for entitled persons.

In case of *patents*, the information on the used technology is public and, thus, should not pose a problem for a producer in case it is described at the court or in the court file as part of the evidence. The producer could, however, get in trouble if the investigation, for instance, reveals that the producer uses technology that is patented by someone else. From a moral perspective, this should not be perceived as problematic though and potential consequences should be resolved within separate patent litigation. Another potential issue arising from the investigation may be a claim of a forensic expert that a patent in question does not function as described in the patent application. This would naturally lower the value of the respective patent and a producer could sue the expert within civil proceedings.

What concerns *trade secrets*, the situation is more complex. The value of trade secrets is conditioned by keeping the information confidential. In the civil law disputes, Czech law has means on how to protect trade secrets that is communicated at the proceedings as evidence. A judge can for instance exclude public from the hearing and impose an obligation on participants of the hearing to keep the information confidential. Similar measures can be imposed when people request to access documents of the court file on the respective case. If a person violates the confidentiality obligation, they can be sued for such violation. However, the situation differs in criminal proceedings. In criminal proceeding, all the participants are obliged to provide all the requested information regardless of whether such information is protected by trade secret. Moreover, trade secret cannot be used as a legal means for excluding the public from attending the hearing in criminal proceedings. In such case, however, the participants are bound by confidentiality. Misuse or misappropriation of information protected by trade secret can be prosecuted as criminal offence.

Unfortunately, with regard to autonomous vehicles, the mentioned protection might not be efficient at all. The reason is that the main functionalities of autonomous vehicles are based on algorithms that operate mostly uninspected. Competitors can get inspired, gain the information and use it in own technological solutions. The right holders of a trade secret may have no chance to find out that their algorithms have been used elsewhere and potentially adapted. The right holders will face the traditional problem with information technology – its non-transparent operation and impossibility to inspect deployed algorithms. In such a case, the right holder can probably only wait until a vehicle of the competitor causes a similar accident and information on its operation will be revealed during criminal proceedings. That is, however, quite an unfortunate and inefficient solution that can also cause market distortion.

What concerns *copyright*, it is doubtful that courts will examine a source code of a computer program. It is more probable that traditional computer programs, as opposed to algorithms for machine learning, will play a minor role in autonomous vehicles.

CONCLUSION

Even though autonomous vehicles will reduce the number of accidents and will increase transportation safety, accidents will not be prevented altogether. In such case, an extensive investigation will most probably take place. Evidence that may cover information protected by trade secrets could be presented at the public hearing within criminal proceedings. Especially with regard to trade secrets, the situation can get difficult because trade secrets will cover mostly algorithms. In case the algorithms are copied, they can be deployed without any inspection and possibility to find out breach of trade secret by a competitor. Evidence of such misappropriation could be obtained in the future by introduction of new legal obligations on high-risk systems in the proposal of the *AI Act*.[29] The obligation to maintain technical documentation shall lead to greater transparency. However, as it is not precluded that the technical documentation itself will be protected by trade secret, it might be even more difficult to obtain it.

In the light of the presented information, solving the problem of own IP protection strategy when it comes to autonomous vehicles may not be an easy task. Trade secrets will stay a part of the strategy despite they might be risky when it comes to algorithms. In fact, trade secrets are the main tool for protecting own algorithms since algorithms cannot be patented or protected by copyrights. At the same time, if an autonomous vehicle causes an accident when a substantial damage occurs or there was an injury resulting in health issues or death, criminal investigation is unavoidable and a producer of an autonomous vehicle will be requested to provide necessary information at court. What would be probably the most efficient solution to this problem while avoiding misappropriation of trade secrets, is making the deployed algorithms public and transparent at the first place. A producer then could benefit not only from the fact that he does not need to adopt specific measures on protecting algorithms, but also from increased trust of users who would know that the algorithm is transparent and can be improved by a wide community of software engineers who could suggest improvements.

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[29] Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL LAYING DOWN HARMONISED RULES ON ARTIFICIAL INTELLIGENCE (ARTIFICIAL INTELLIGENCE ACT) AND AMENDING CERTAIN UNION LEGISLATIVE ACTS. In: *EUR-Lex* [online]. 21. 4. 2021 [2022-05-15]. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0206>.