Session Report

Date: 10 day/02 month/2022
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TECHNICAL SESSION: SP2 SMART ROADS CLASSIFICATION
THURSDAY FEBRUARY 10, 05.15 PM TO 06:45 PM

1. KEYWORDS

Autonomous vehicles, smart road, mobility, road classification, Intelligent transport systems, Vehicle-to-Infrastructure communication, connected.

2. PRESENTATION OF THE SESSION

Traditionally, road network classification systems have focused on two fundamentally opposite dimensions: mobility and accessibility. These classification systems have been adapted to the variable circumstances of countries or regions. However, with Connected and Automated Vehicles (CAVs) coming into play, the situation has become quite more challenging than before.

Current CAVs consist of diverse Advance Driver Assistance Systems (ADAS) that assist humans in the driving task. The automotive industry is carrying out a great research effort, so the most advanced systems can even control the vehicle operation. However, there is a plethora of different systems, varying in how this assistance is performed. As a result, not all CAVs perform in the same way and, what is more, this performance is evolving over time.

In order to clarify the capabilities of these new vehicles, the Society of Automotive Engineers (SAE) developed a classification system that grouped these capabilities in six levels. SAE level 0 applies to human-driven vehicles. SAE level 1 refers to driving automation systems that can either control the longitudinal or the lateral position of the vehicle. SAE level 2 refers to the systems that can control both –longitudinal and lateral position– at the same time. In these cases, the system is considered to just assist –not replace– the human. Moreover, these systems are not infallible and may suddenly disconnect –i.e., disengage– releasing the control to the driver, who must be attentive to the road.

SAE level 3 goes a step further, being able to control more situations and preventing disengagements. These vehicles are supposed to foresee disengaging situations and request the driver intervention in advance. SAE level 4 vehicles are expected to be fully autonomous within a certain region that meets certain characteristics –called Operational Design Domain, ODD– not needing the intervention of a human in these zones. Finally, SAE level 5 vehicles are expected –in a distant future– to be fully autonomous regardless the zone they are driving through.

This session will present the PIARC Special Project "Smart Road Classification". This Special Project presents an exploratory study about the feasibility of a Smart Roads Classification system. Identifying which steps should be done first becomes crucial. One of the activities of the Special Project was exploring the feedback about follow-up proposals from several stakeholders. The most important contributions are outlined here: https://www.piarc.org/en/order-library/36443-en-Smart%20Roads%20Classification

3. PROGRAMME OF THE SESSION

Session Chair: Oscar Gutierrez-Bolivar. Ministry of Transport, Mobility and Urban Agenda, Spain
Session Organiser: Patrick Malléjacq. Secretary General, PIARC
Session Secretary: Patrick Malléjacq Secretary General, PIARC

Person	Organisation, Position…	Title of the presentation
Francisco Javier Camacho Torregrosa,	Valencia Polytechnic University, Spain	Background, Feasibility and What a Smart Road Classification System could provide
Francisco Javier Camacho Torregrosa,	Valencia Polytechnic University, Spain	PIARC's special project on Smart Roads Classification: Report Conclusions, Benefits, Limitations, and Practical applications
Francisco Javier Camacho Torregrosa,	Valencia Polytechnic University, Spain	Disengagement patterns of existing vehicles

4. TECHNICAL FINDINGS AND DEBATE

The first presentation shows the feasibility of the very classification for the new requirements. The interaction between the capabilities of vehicles and road was addressed. The constraints are the level of autonomy of vehicles, the digitalization of the infrastructure, the information available about classification and other data as disengagement that occurs when there is a lack of homogeneity. Different scenarios were considered for analyse the advantages of the classification of roads.

The second presentation was about a proposal for road classification. Five levels were considered from the lower when automation is discouraged, to the top when the top autonomy is possible. The infrastructure communication support varies from no support, level E, to the cooperative one, level A. Additionally, the readiness of the infrastructure to provide a continuity in the service along a section is considered in 5 other levels, from the frequent disengagements to the full support. It depends mainly on the physical characteristics. The combination of both criteria is the essence of the road classification. Road Administration or operators should keep a reliable inform to users. It will be very desirable the manufacturers were involved in this process.

Third presentation deals with disengagement. An example for a level 2 vehicle shows how the vertical and horizontal alignments, marking or lane width can limit the use of the automatic systems in some stretches of the road. Combining vehicle capabilities and road limitations is not easy and so to inform users about the areas of derangement. Author advice manufactures to take an active role for testing those circumstances and to establish a fluid communication with road administrations or operators.

An anonymous question arose about compliance in the future. The answer was that it was not considered in the project, though it seems that will be addressed in similar way or better than nowadays.

The participation of automotive industry or other developers in the project were so scare. The presenter as well as the Secretary General, Patrick Mallejacq expressed they concern about it and the compelling need that this lack must be overcome in the future. Fierce competition and secrecy could be the causes that impede this essential dialog among them and Road Administrations. Nevertheless, PIARC is optimistic about finding ways.

Martin Thibault pointed out a complex issue as is the geographic interoperability of the classification. This is a great challenge with plenty of uncertainties, but a great effort must be done in the future for harmonizing the information to users all around the world.

Jean-Claude Roffe was interested in digital and physical adaptations. The project considers some of them, as 5G, sensors or others that have a crucial role in the classification, but thought some of them were addressed it was not an objective to detail all the possibilities.

Similar concern as Martin Thibault was expressed by Erika Natson about the consensus among different organization about the levels of classification. The levels could be more or less, but they try to cover in the more universal way the possible scenarios. It doesn't seem quite difficult to reach some agreement in the future for practical reasons.

Daniel Russomanno showed his interest on the role of electric vehicles in the project. The real thing is that no special attention was paid to electric vehicles in the project, no because they are not relevant, but it doesn't seem that, for the objectives of the project, it had changed the results.

5. RECOMMENDATIONS FOR DECISION MAKERS, FOR PIARC OR FOR INTERNATIONAL ORGANISATIONS

Although there are still a lot of uncertainties, the project provides a tool to the road management that will ease to face that future. Things could change in the future, but this project provide a framework to Road Administrations and operators where they can take better positions for forecasting the future.

The road infrastructure has been in some way relegated by the autonomous vehicle disrupting brilliancy. But the infrastructure, in an unavoidable way, will be present in that autonomous world as the main partner. So, it is time to take the place that infrastructure deserve, and to rise the voice remembering that roads are still alive and will be an essential part as it is today, or even greater, of the mobility in the future.

6. PREPARATION OF THE SESSION

This session was planned, designed, and organised as follows.

All the organization staff and translator were very helpful, kind, and efficient.
Special consideration must be given to the co-authors of the project: Alfredo García, David Llopis and José Francisco Monserrat del Río.
Also to the Members of the Project Overshigt Team: Sylvain Belloche, Frédéric Champagne, Denis Cornet, Lorenzo Domenichini, Ana Luz Jiménez, Ali Mahdmina, Antonio Muruaís, Vicente Sebastián, Lucy Wickham, Miguel Caso-Florez and Patrick Malléjacq.