



New Standards Initiatives on Automated Vehicles

An automated vehicle is a vehicle that is capable of sensing its environment and moving safely with minimum or no input from human beings. Recent literature, industry projects, and prototypes have revealed its potential to improve transportation efficiency due to better synchronization of vehicle movements and to improve safety by potentially reducing the number of accidents, injuries, and fatalities on the road while enabling new emerging applications. Even though there are rigorous and well-defined levels of automation [1], there are different interpretations and understandings on the state-of-the-art technologies of automated vehicles that may send a mixed and potentially confusing message to end users.

To address these issues, the Standards Board of the IEEE Standards Association has recently approved the formation of the following four new projects proposed by the Automated Vehicles Working Group of the IEEE Consumer Technology Society Standards Committee:

- IEEE P2040: Standard for General Requirements for Fully Automated Vehicles Driving on Public Roads
- IEEE P2040.1: Taxonomy and Definitions for Connected and Automated Vehicles
- IEEE P2040.2: Recommended Practice for Multi-Input Based Decision

Making of Automated Vehicles Driving on Public Roads

- IEEE P2040.3: Recommended Practice for Permitting Automated Vehicles to Drive on Public Roads.

IEEE P2040 specifies general requirements that a fully automated vehicle shall meet to drive on public roads. This project serves as a comprehensive checklist of all of the use cases, scenarios, and worst conditions that a fully automated vehicle certified by the public body shall address on public roads to protect the safety of the public, including passengers, pedestrians, and other traffic participants [2].

IEEE P2040.1, on the other hand, specifies taxonomy and definitions for connected and automated vehicles [3]. The purpose of this project is to clarify the necessary functionalities of connected and automated vehicles with the desired outcome of helping end users make choices while staying safe.

Environmental sensing is the core of automated vehicles, which must use the information collected via sensors (e.g., camera sensors, radar sensors, light detection, and ranging sensors) to make driving decisions. The information used for decision making is not limited to the environment around the vehicles but also includes inputs from other surrounding vehicles and infrastructure. IEEE P2040.2 provides the recommended practice for an automated vehicle driving on public roads

to determine the next action based on multiple sensing inputs, with the desired outcome of maximizing safe driving while avoiding negative impact on traffic flow. It also itemizes the cases when different inputs suggest different actions and recommends solutions in these cases [4].

P2040.3 addresses the problem that state-of-the-art vehicle functionalities cannot yet address all of the circumstances on roads to ensure safe driving by providing regulators with the recommended practice for permitting automated vehicles to drive on public roads when specific conditions are met. This document itemizes combinations of vehicle capabilities and different situations on public roads with the aim of facilitating the adoption of automated vehicle technologies while ensuring safety and efficiency in traffic flows [5].

References

- [1] "Automated vehicles for safety." National Highway Traffic Safety Administration. <https://www.nhtsa.gov/technology-innovation/automated-vehicles> (accessed Feb. 28, 2021).
- [2] "PARdetail:P2040." IEEE. <https://development.standards.ieee.org/myproject-web/public/view.html#pardetail/7332> (accessed Feb. 28, 2021).
- [3] "PAR detail: P2040.1." IEEE. <https://development.standards.ieee.org/myproject-web/public/view.html#pardetail/7333> (accessed Feb. 28, 2021).
- [4] "PAR detail: P2040.2." IEEE. <https://development.standards.ieee.org/myproject-web/public/view.html#pardetail/7334> (accessed Feb. 28, 2021).
- [5] "PAR detail: P2040.3." IEEE. <https://development.standards.ieee.org/myproject-web/public/view.html#pardetail/7335> (accessed: Feb. 28, 2021).