

3 OPERATING DEPENDABILITY AND SAFETY OF AUTONOMOUS VEHICLES

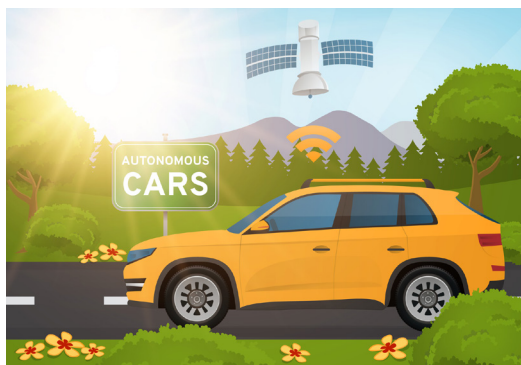
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Automation of transport systems, whether individual or collective, has always been a major challenge in ensuring safe and efficient mobility for citizens. Genuine technological and performance leaps have been achieved at different levels of automation to enhance socio-economic, functional and security performance. Self-driving vehicles should be capable of operating in fully autonomous mode under real traffic conditions and on non-specific infrastructures, without requiring human driver intervention. Their proper operation will depend on the equipment's safety level, software quality and reliability of the information used by the onboard intelligence.

Navigation system, a risk not to be overlooked

Car manufacturers and OEMs³ have made extensive efforts to develop an optimum ecosystem for the safety of self-driving vehicles. Their automation has been made possible through the use of geo-tracking technologies via GPS⁴ and in the near future Galileo. It is however possible to deceive a GPS receiver by misleading it to believe it is in another physical location than where it actually is. The risk then would be that self-driving vehicles be diverted to other locations than the users are targeting. This type of attack should be taken into consideration in analysing the security of hardware and software components as well as at system level.



Complexity of the road system, a point to be taken into consideration

Unlike driverless metro systems, full automation of on-road vehicles, which operate in a complex urban context, requires uncompromising demonstration of equipment safety, both onboard the vehicle and as built into the infrastructure. Such demonstration shall be carried out in detail and in reliable conditions, covering both normal and complicated situations so that all dangerous situations be factored in. Safety is therefore a major challenge for the future of self-driving cars and should be able to satisfy the zero-accident requirement at a reasonable cost.

Knowledge transfer to ensure users' safety

For many years, Ifsttar has developed expertise in driving automation and in the area of certification for automated safety systems in track-guided transports. The Institute's teams have been working in the fields of signalling, command-control (hardware and software) and systems safety and security to contribute to the commissioning of TGV high-speed trains and driverless metro systems. Ifsttar was thus called upon for almost all of the automatic track-guided transport systems implemented in France. This synergy between competences in on-road vehicle automation and the safety expertise for driverless metros will contribute to the safety of automated road vehicles.

1. ESTAS: Evaluation of Automated Transport Systems and their Safety Laboratory
2. COSYS: Components and systems Department
3. OEMs: Original equipment manufacturers
4. The GPS global positioning system is an American satellite-based navigation and position-tracking system. Galileo is its European counterpart.
5. LIVIC: Laboratory for Vehicle Infrastructure Driver Interactions

Learn more about

- > The ESTAS¹ laboratory
- > The LIVIC⁵ laboratory



Further readings

Legrand C., Beugin J., Conrard B., Marais J., Berbineau M., El-Koursi E.-M. From extended integrity monitoring to the safety evaluation of satellite-based localisation system. Reliability Engineering and System Safety. DOI-10.1016/j.res.2016.04.011, 2016.

EL-KOURSI EM., COUVREUR G., BARANOWSKI F., FLAMANT F., BUTIN A., The renovation requirements for the VAL manless system in Lille, APM, Automated People Movers and Transit Systems, May 22 - 26, 2011, Paris, France, 2011, 8 p.



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