Introduction

Human errors are the main cause of 75% of road crashes. Additionally, human errors are involved in some way in 95% of crashes. Much effort has been made to understand the behavioural factors affecting driving performance, and consequently, crash risk. Distraction, fatigue, and drowsiness are examples that led to the development of detection and warning systems already featured by some vehicles currently in the market. Conversely, the large-scale launch of automated vehicles (AV) is seen as a key instrument to fulfil the ambitious goals of the European Commission’s "Vision Zero" strategy, aimed at eliminating road crashes caused by human errors by 2050. Researchers, industry and policy-makers currently agree that a successful transition to automated driving relies not only on people’s adaptation to new technologies, but also on automated systems that comply with the society’s expectations in terms of usability and safety. Therefore, the development of collaborative systems between humans and technology is crucial to the acceptance of AV and the progression towards a fully automated road transport.

Methodological Approach

The first stage of this research is currently in progress under the AWAREE project. This project is focused on the impairing effects from driver inattention on road crashes. For that, a driving simulator study will be conducted to characterize driver-vehicle interactions in scenarios of no automation, allowing to isolate the effects of human errors from the intervention of driver assistance technology during regular and critical driving events.

In a second stage, a comprehensive survey will be carried out to assess current acceptance of AV technology and derive the requirements and use cases of different groups of drivers. The survey results will be used to design driving simulator scenarios, which will be followed by an incremental analysis of driver-vehicle interactions for successive levels of automation. Relevant driver-centred issues of AV technology will be investigated, including the improper use of driver assistance, the
takeover of vehicle control, and the compliance with the driver’s behavioural intentions in regular and critical situations.

EXPECTED RESULTS

Three main contributions are expected from this research: (i) a comprehensive mapping of risk factors associated to different groups of drivers and levels of driving automation technology, (ii) a set of recommendations to improve the design, safety and usability of driver warning and automated driving systems, and (iii) the rise of public awareness of automated driving from the users’ standpoint.

CONCLUSIONS

This research follows an emerging user-centric approach, benefiting from strong receptivity among the scientific community, industry, and policy-makers. The incremental study of driver-vehicle interaction across different levels of automation will allow to identify relevant safety issues associated to each level, distinguishing between the contribution of drivers and vehicle technology. The results will be aimed at enhancing the development of new, safe and collaborative concepts of Human-Machine Interfaces and Advanced Driver Assistance Systems, as the industry is keen on bringing human factors into the design process and embedding human cognitive capability into the control path of autonomous systems. Collaborative systems will more effectively address the requirements of different groups of users, promoting social inclusion and boosting the societal acceptance and market adoption of AV. Through this impact, this research will also contribute to the “Vision Zero” strategy by reducing the frequency and impact of road accidents caused by human errors.