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Guest Editorial: Driver Distraction and Inattention: Meeting the Challenges of New Technology and Automation

Alexandra Fort, Christophe Jallais, Trent W. Victor, Michael A. Regan

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Title: Driver Distraction and Inattention: Meeting the Challenges of New Technology and Automation

Authors: Alexandra FORT, Christophe JALLAIS, Trent VICTOR and Michael REGAN

Driving is a complex and dynamic activity that requires the driver to constantly manage changes in the driving environment [1]. To achieve this, the driver must select and prioritize information from the environment, therefore he/she has to maintain an optimal level of activation [2]. In this context, even the slightest lapse of attention can have serious impact on road safety.

The bi-annual International Conference on Driver Distraction and Inattention was initiated in 2009 by Michael Regan (ARRB Group, Australian Road Research Board) and Trent Victor (SAFER, Vehicle and Traffic Safety Center at Chalmers, and Volvo Cars). The 5th DDI conference (2017) was co-organized by Ifsttar (French Institute of Science and Technology for Transport, Development and Networks), SAFER and the ARRB Group.

This special issue expands on some presentations from the 5th DDI conference held in Paris (March 20-22, 2017). During DDI conferences, recent developments and trends in the field of inattention and distraction in driving are presented. Presentations and discussions are organized covering basic and applied research, challenges in mitigating distraction and inattention, the latest policy developments, and priorities for research and countermeasures development. Therefore, research about new forms of mobility (e.g. autonomous vehicles, electric vehicles), emerging sources of distraction (e.g., smartphone, touchscreen) and driver monitoring were discussed¹.

One subtopic of the 5th conference concerned the challenges of new technology and automation. The emergence of future autonomous vehicles will redefine the driver's role from an active operator to a supervisor. However, depending on the level of automation, a supervisor could be required to take over the control of the car in certain situations or in case of emergency. In their paper, Cunningham and Regan emphasize the attentive issues for this critical transition from automation-to-manual and review the literature concerning inattention and distraction during the use of highly automated driving. They shed light on different countermeasures to prevent the effects of inattention and give several future research directions about understanding and management of distraction and inattention.

Future challenges could also concern the use of new technologies during driving. Throughout the last decades, several studies have demonstrated the effects of the use of the mobile phone while driving. Smartphones offer new usage possibilities as many different applications (apps) exist that can distract drivers (e.g. games, communications). Therefore, smartphone usage represents a major concern for road safety. In their study about the use of smartphones in a naturalistic study, Albert and Lotan introduce new means to measure the occurrence usage of smartphones by

¹ Proceedings of the DDI2017 conference can be downloaded here:
<http://www.ifsttar.fr/collections/ActesInteractifs/AII2/index.html>

young drivers. Their results reveal not only an intense usage of the smartphone but also that young drivers can underestimate their smartphone usage while driving.

Another major cause of inattention is fatigue [3]. Large and collaborators also investigate new design of Human Machine Interaction with the purpose to diminish potential human deficiencies due to fatigue. Using behavioural and physiological data, they explored how engaging drivers in conversation with a digital assistant may increase arousal and driving performance.

Modern cars are now often equipped with a display in the center stack. These displays were originally used to control the stereo or navigation system. Now they can also be used to adjust the vehicle settings and can handle telephone and data communications, and are considered as modern infotainment systems. Due to the quantity of information they can carry, these systems can increasingly induce visual distraction. These displays are often touchscreens and therefore can also induce tactile distraction. In their paper, Eren and collaborators underline the importance to design in-vehicle touchscreens to allow the driver to use his/her peripheral vision for making simple button selections, as a method to reduce distraction when interacting with these kind of systems.

Distraction can not only be caused by visual distraction. A phone conversation can cause internal distraction as attention may be redirected from the driving task. Literature has shown effects of cognitive distraction on driving performance. It is commonly assumed that variations of cognitive load can have negative impacts on the driving task, like an increase of reaction times to sudden events. According to the cognitive control hypothesis, these impacts could differ according to which type of automatic or cognitively-controlled driving task is performed. In their paper, Engström et al introduce a computational simulation model that could give an explanation of why the effects of cognitive load on driving performance can be dependent what type of driving task is being performed.

The 5th DDI conference saw an increase in the number of studies showing the importance of new issues associated with automation and the necessity to keep drivers' in the loop to regain the control of the car in a safe way. Future studies will likely take into account what kinds of secondary tasks the drivers could do when in a highly automated mode. Therefore, new research on distraction and inattention topics should deal with the level of engagement/disengagement of the driver during the use of such automated systems.

The next DDI conference will be held in Gothenburg (Sweden) during October 15-17, 2018² and will have a subtopic on driver engagement during assisted driving. Whilst future mobility and new technologies will likely be the focus of several presentations and discussions linked to distraction and inattention, several other presentations and papers will likely deal with distraction affecting other road users, e.g. pedestrians, cyclists, motorcyclists, and from domains other than road transport, e.g. aviation, medicine, and rail.

² <http://ddi2018.org/>

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