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Editorial

The Importance of Fatigue-Monitoring as a Tool for the Intelligent Transport Systems (ITS)

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The impact of fatigue on driving safety is a manifest hazard, in fact, widely supported by empirical evidence. In short, fatigue not only decreases the effectiveness of essential processes to drive accurately, such as attention and vigilance [1], work memory and decision-making [2], but predicts, in the short term, a higher risk to be involved in traffic crashes [3], and, in the medium and long term, different psychophysiological disturbances which endanger the health and welfare of drivers and other road users [4-6]. Actually, about 20% of fatal traffic crashes involve driver fatigue, and 60% of U.S. adult drivers affirm that they have driven at least once under a substantial state of fatigue over the last year [7,8].

Several measures have been adopted to prevent accidents related to driver fatigue, but possibly, the Intelligent Transport Systems (ITS) could represent the most suitable framework to strength the technical interventions to globally address this problem. As a concept, ITSs can be conceived as a large set of technological and telematical solutions aimed to improving the operation and safety of ground transportation through the integration of information, sensor, control and communication technologies [9].

In brief, for the case of Transport Management Systems [10], different improvements have been documented with the assessment of the impact of ITSs on transport safety: A greater flow of information, feedback, greater contact with the control centers, warnings about the condition of the tracks are some of the positive aspects that have made it easier for thousands of drivers to travel less likely to suffer accidents or unforeseen events [11,12]. On the other hand, however, there has also been described a substantial increase in terms of demands for drivers, implying (e.g.) a more exhaustive attentional process, the appearance of new potential stressors at the wheel and/or the exacerbation of those already existing, and the irrevocable need to perform more simultaneous tasks at the same time as those traditionally involves the complex process of driving.

The above mentioned has led to some studies mentioning "collateral" effects of ITSs, which, although to a limited extent, are detrimental to the safety of drivers. Such is the case of distractions at the wheel and fatigue as a consequence of overexposure to different stimuli. In this respect, it should be noted that not all Intelligent Transport Systems applied to drivers have yet contemplated the monitoring of these factors as an essential measure to not only prevent ITSs from becoming counterproductive in some sense, but to maximize potential improvements in Safety in the field of driving.

Furthermore, the growing challenge for the application of technological measures aimed at improving road safety through the design of new devices and developments to be integrated to different types of vehicles, especially those that are operated during long shifts or distances (i.e. trucks and public service vehicles) [9], remains a latent difficulty, taking into account that the interaction between the system and the user is a substantial challenge that ITS' developing must face [13]. Taking into account the aforementioned, it makes necessary the examination of more complex functions and its adaptation to represent a better interaction to the driver, and a further adapting to the features and needs of each user, according to individual differences among them (e.g. age, experience and driving performance). In fact, driver adjustment is a complex outcome from an entire process of (e.g.) road formation/education, further training and –in this case- adaptation to new elements and devices that become part of the driving experience [14,15].

In conclusion, a succinct emphasis should be placed not only on the potential of ITSs as an undoubtedly useful and promising mechanism to improve road safety, which has now been successfully implemented in professional drivers and transport companies, but also in the potentialities that are still pending to be exploited and translated into road safety in general. And for all drivers, through the design of more intelligent vehicles, at the same time more useful to prevent accidents, especially those derived from driver's fitness.

Perhaps, one of the most important remaining actions related to ITS on vehicles [16], is to create and standardize mechanisms that allow the timely detection of psychophysiological parameters of drivers, able to alert about the presence of fatigue symptoms that can endanger their safety and of all road users in general.

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