Editorial

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Biographical notes: Francesco Benedetto is the Associate Editor (area: wireless signal processing and traffic engineering) for the *International Journal of Mobile Network Design and Innovation*, since 2013, and the guest editors for many other international journals. His research interests are in the field of digital signal and image processing in telecommunications, code acquisition and synchronisation for the 3G mobile communication systems, multimedia communication, software and cognitive radio, and finance engineering. He is the Chair of the Revision Ad-Hoc Meeting of the IEEE 1900.1 Working Group on 'Definitions and Concepts for Dynamic Spectrum Access: Terminology Relating to Emerging Wireless Networks, System Functionality, and Spectrum Management'.

Fabio Tosti received his MSc and Eng. degree (summa cum laude) in Road Transportation and Infrastructures from the Sciences of Civil Engineering Department of Roma Tre University, Rome, Italy, in 2010. In 2014, he received his PhD with European Doctorate Label (excellence rating) in Civil Engineering from the same department. His research work has focused on the development of ground-penetrating radar (GPR) methods and the use of other non-destructive techniques for road safety issues. He is the leader of the scientific project 2.5 dealing with subsurface moisture content evaluation with GPR, within the COST Action TU1208 'Civil Engineering Applications of GPR'.

Over the past few years, road safety issues are sadly emerging as a major priority to be tackled by governments worldwide. Ever more alarming data are increasingly, demanding the use of intelligent solutions for effective and efficient preventive and management actions. To cite a few, nearly 1,300,000 people die in road crashes each year, on average 3,287 deaths a day, and an additional 20,000,000–50,000,000 are injured or disabled. In addition, road traffic crashes rank as the ninth leading cause of death, as they account for 2.2% of all deaths globally, and are the leading cause of death among young people (age 15–29), and the second leading cause of death worldwide among very young people (age 5–14). Accordingly, such scenario is rapidly leading to a no more sustainable situation concerning social costs: more than USD$518 billion are spent globally, thereby costing to individual countries from 1%–2% of their annual gross domestic product (GDP), on the average. Amongst these statistics, however, data related to fatalities rate in low and middle-income countries, which amounts to the 90% of the total fatalities with less than half of the world's vehicles, should draw the attention of the experts in the field of road safety and guide decided improvement strategies.

In this regard, high-income countries are benefiting of the use of intelligent technology to road safety issues since a long time, while it is less or no spread in the poorest countries. Therefore, great challenges to be pursued in the near future on the use of such technology will be both

1 to enhance the current technology readiness level where it is already highly ingrained in road safety policies

2 to be introduced as a key point for the lowering of fatalities from car accidents in those countries where it is still poorly widespread.

Otherwise, recent estimates predict that unless action is taken, road traffic injuries will become the fifth leading cause of death by 2030. In line with this, the use of information and communication technologies (ICTs) in vehicles can be a key point on which to address experts' efforts and economic resources. Intelligent car safety systems make use of ICTs to provide solutions for improving road safety in particular in the pre-crash phase.

Such systems operate either autonomously on board the vehicle or cooperatively through vehicle-to-vehicle or vehicle-to-infrastructure communications. Basically, they allow for ensuring safe speed, lane support, safe following, pedestrian protection, improved vision, driver monitoring and intersection safety. Overall, their two major contributions are that they can prevent collisions during lane changes or lane departure and provide vehicles with an automatic emergency call system. Anyhow, the achievement of these goals requires considerable research efforts in the development of methodologies, tools and technologies through innovative methods and algorithms for wireless sensors networks applied to road safety and simulation.

In this respect, the contribution of driving simulation studies can play a crucial role for both calibration and validation of intelligent car safety systems. It is well-known that the main benefit from driving simulator is to create a natural interaction between users and virtual environment, which is in turn gradually improving thanks to the advances achieved in multimedia and simulation technologies. Such continuous enhancement allows obtaining increasingly reliable data for characterising driver's behaviours in dangerous events, thereby providing a comprehensive platform on which testing the effectiveness of ICTs.

Our intent is to collect in this special issue papers on the most recent mobile and wireless sensor technologies insights applied to road safety and simulation. This goal is herein pursued through the presentation of five articles spanning from the prevention to the management of critical events using different ICTs.

In the first paper, entitled 'Predictive speed models for two-lane rural roads using GPS equipment' by Bella et al., it is analysed the effectiveness of a low cost global positioning system (GPS) installed in a medium passenger car for modelling drivers speed behaviour and for providing predictive models of operating speed and speed differential. In particular, new speed models specific for Italian two-lane rural roads, based on the analysis of thirty-six speed profiles performed along a road segment characterised by thirteen tangent-curve configurations, are herein proposed. The predictive models of operating speed and speed differential in several road path elements developed by the authors highlight the most relevant independent variables having the greatest impact in the definition of the models.

In the second paper, entitled 'Using GPS data to detect critical events in motorcycle rider behaviour' by Cafiso et al., a methodology for identifying critical events in naturalistic powered two-wheeler (PTW) studies using GPS data is presented. The recall and precision of the procedure in identifying actual near crashes is tested by comparing the results with the subjective identification and classification of the critical events provided directly by the PTW's rider during the experiment. The study confirms the GPS as a simple and cheap system to install. In addition, important information on the most reasonable frequency of data acquisition are provided along with the possibility to analyse driver behaviour in traffic conflict situations.

The third paper, 'A calibration framework of car following models for safety analysis based on vehicle tracking data from smartphone probes' by Guido et al., introduces a new methodology for acquiring vehicle tracking data to be employed for calibrating and validating micro-simulation traffic models for road safety analyses. In particular, a procedure based on the use of on-board assisted-GPS equipped smartphone probes supplemented by other location services, including Wi-Fi positioning system and cell-site multilateration, is herein proposed. The VISSIM® software is used for the calibration procedure wherein a genetic algorithm is implemented to systematically modify the parameters of car following behaviour model, aimed at fitting vehicle tracking data obtained from simulations to the measured ones. Results suggest that the micro-simulation model is able to replicate the observed safety performance indicator promisingly.

The fourth paper of this special issue is 'The effects of automatic speed photo-radar enforcements on Taiwanese freeway systems' by Wang and Kou, and investigates the effects of automatic speed photo enforcement (SPE) devices on speed and crash distributions on a major freeway section, based on observations from four SPE zones. Comparisons between differences of speeds and traffic crash distributions at upstream and downstream sections of the SPE fixed locations indicate that the fixed SPE devices significantly decrease the mean speed at the fixed SPE point and continue their influence for the next two kilometres at both suburban and rural freeway sections. In some cases, results suggest a lowering of the number of traffic crashes at the location immediately downstream of the SPE point, although a direct impact on crash occurrence when vehicles approach the fixed SPE points needs to be further demonstrate.

The last paper of this special issue, entitled 'Real-time tools for situational awareness and emergency management in transport infrastructures' by Coconea et al., discusses the integration of wireless sensor networks (WSNs) and virtual reality (VR) to support rescue personnel within critical transport infrastructures environments, such as interchanges, long tunnels and bridges. In particular, the authors focus on two key aspects of emergency operations, namely, the collection of real-time data and the improvement of the timeliness of first responders through efficient provision of the collected data. A comprehensive demonstration of the qualitative and quantitative impact of such an approach on emergency situation management is described.

Great thanks go to all of the authors for submitting their papers to this special issue and to all the reviewers for spending invaluable efforts to evaluate the submissions. The guest editors would also like to thank the Editor-in-Chief (EiC), Prof. Dr. M. Bartolacci, along with the journal management staff for their gentle assistance during the review and decision processes. Finally, we hope this special issue will be of interest for the readers and it may provide useful insights for achieving significant improvements in the field of WSNs for road safety and simulation.