# Editorial

## Rashid Mehmood*

College of Engineering,
Swansea University,
Swansea SA2 8PP, UK
Email: r.mehmood@gmail.com
*Corresponding author

## Alexey Vinel

Saint-Petersburg Institute for Informatics and Automation,
Russian Academy of Sciences,
14 Linia, 39, SPIIRAS,
St. Petersburg 199178, Russia
Email: vinel@ieee.org

## Yan Zhang

Simula Research Laboratory,
Martin Linges v 17,
P.O. Box 134,
Fornebu, Lysaker 1325, Norway
Email: yanzhang@ieee.org

**Biographical notes:** Rashid Mehmood currently holds a Lectureship in Computing and Communications at the College of Engineering, Swansea University. He leads a research group at Swansea that is developing state of the art technologies through cross-disciplinary research and international collaborations. He has a multi-disciplinary background with qualifications in Electronics and Communications Engineering, Business and Computing from institutions including Universities of Oxford, Birmingham and Cambridge. His core expertise is in stochastic modelling, simulation and analysis of large-scale datasets and complex systems, and high performance computing. He has applied his expertise in a diverse range of application areas including telecommunications, intelligent transportation systems and healthcare. He has led and contributed to a large number of academic-industrial collaborative projects including multiple DTI/TSB academia-industry collaborative project and six UK-wide Research Councils Digital Economy research clusters. He is a member of ACM, OSA and IET, and a Senior Member of IEEE. He is the Second Vice-Chairman of the IET Wales South West Network.

Alexey Vinel is a Research Scientist at the Department of Communications Engineering (DCE), Tampere University of Technology (TUT), Finland and a Head of Telecommunications Technologies and Computer Networks (TTCN) Group of Saint-Petersburg Institute for Informatics and Automation, Russian Academy of Sciences (SPIIRAS). He received his PhD (2007) degree in Technical Sciences from the Institute for Information Transmission Problems, Russian Academy of Sciences, Moscow (IITP RAS). Prior to that, he was

studying at Saint-Petersburg State University of Aerospace Instrumentation (SUAI), where he received his Master's (2005) and Bachelor's (2003) degrees in Information Systems, both with honours. He is a Fellow of Alexander von Humboldt Foundation (2008), Member of organising and technical committees (including TPC Chairs) of numerous international conferences. He is a Guest Editor of several journals Special Issues including *IEEE Transactions on Vehicular Communications*. Currently, he is Chairing the Special Interest Group on Intelligent Transportation Systems within the COST IC0906 Action.

Yan Zhang received a PhD degree from Nanyang Technological University, Singapore. From August 2006, he is working with Simula Research Laboratory, Norway. Currently, he is a Senior Research Scientist at Simula Research Laboratory, Norway. He is an Associate Professor (part-time) at the University of Oslo, Norway. He is a Regional Editor, Associate Editor, on the editorial board, or Guest Editor of a number of international journals. He is currently serving the Book Series Editor for the book series on *Wireless Networks and Mobile Communications* (Auerbach Publications, CRC Press, Taylor & Francis Group). He serves as organising committee chairs for many international conferences, including *AINA 2011*, *WICON 2010*, *IWCMC 2010/2009*, *BODYNETS 2010*, *BROADNETS 2009*, *ACM MobiHoc 2008*, *IEEE ISM 2007*, *CHINACOM 2009/2008*. His research interests include resource, mobility, spectrum, energy and data management in wireless communications and networking.

---

Rapidly decreasing costs of computational power, storage capacity and mobile communication technologies have led to rapid advancements in every aspect of our life. Transportation is one of the most important sectors where information and communications technology penetration is desired and can be witnessed. Vehicular networks have the potential to transform our lives through intelligent transportation systems. Human safety, environmental sustainability, road congestion, transport inefficiencies, seamless mobility are but a few drivers of research and development in vehicular communication networks. The aim of the communication technologies for vehicles (Nets4Cars: http://www.nets4cars.org/) workshop is to provide an international forum for academics and industry to discuss the latest technologies and research in the field of intra- and inter-vehicular communications systems, protocols and standards, mobility and traffic models, methodologies, and techniques, testing, applications and services. The term 'vehicles' is taken in its broad sense and it includes any moving object such as trains.

This Special Issue on communication technologies for vehicles comprises selected papers from Nets4Cars 2009, held in October 2009 in Saint-Petersburg, Russia and Nets4Cars 2010 held in July 2010 in Newcastle, UK. We have carefully selected eight papers from 30 papers published in the proceedings of Nets4Cars 2009 and Nets4Cars 2010 workshops. All papers were reviewed by at least three reviewers. These selected papers cover a wide range of topics, which can be broadly categorised into the approaches to improve network connectivity for safety and non-safety applications and reliable message delivery. One of the paper focuses on railway environments.

Reliable and efficient message delivery is one of the most important challenges in vehicular networks; three papers included in this Special Issue attempt to provide solutions for this problem. Campolo and Molinaro present their ongoing work on the design of a cooperative scheme for service channel reservation, CRaSCH (cooperative

reservation of SCH). Specifically, they propose a channel reservation scheme, which exploits cooperation among vehicles to improve the delivery performance of non-safety applications over IEEE 802.11p/wireless access for vehicular environment. Ciccarese et al. propose a timer-based flooding scheme, called data-ack scheme, to improve efficiency of message dissemination in vehicular *ad hoc* network networks. This is an important and timely topic because overheads and inefficiencies of message dissemination algorithms are a major hurdle in developing scalable vehicular networks. Slot et al. address the challenges related to the reliability of message dissemination in vehicular networks and propose an application programming interface for safety critical geocast service. The geocast service, which is based on a membership service, is designed considering the strict safety requirements of vehicular coordination applications and the limitations and challenges of the vehicular environment.

Network connectivity management is another critical challenge for vehicular communication systems. Vegni and Little propose a vehicle-to-X protocol switching decision algorithm for seamless vehicular connectivity management by exploiting a hybrid of vehicle-to-vehicle and vehicle-to-infrastructure communication paradigms. They present an analytical model of the protocol-switching algorithm, based on optimal path selection techniques and characterise the maximum and minimum bounds on message propagation. Hasan et al. also address the wireless network connectivity challenge for roadside-to-vehicle communication environment in a different way. They propose a hidden Markov model to estimate network disruption for vehicles accessing public Wi-Fi networks for safety and broadband applications.

Alvi et al. propose verification and control approach to improve safety and reliability by eliminating hazards associated with static and dynamic integration of an intra-vehicular network. Their approach provides means to define overall system behaviour by using first-order logic rules in an ontological space and formally verifies compatibility of each component with the rest of the system. This is a timely and crucial topic due to the increasing number of sensors, electronics and software in a vehicle as well the consumer demands to allow integration of personal devices within a vehicle environment. Shan et al. focus on terrestrial trunked radio (TETRA) systems and present performance analysis of phase modulation schemes along with sub-carrier-based QAM-4 (Quadrature Amplitude Modulation-4) over TETRA propagation models. TETRA, which is a digital trunked mobile radio standard developed by the European Telecommunications Standards Institute, aims to meet the needs of professional mobile radio user organisations as well as public access mobile radio operators. This paper makes an important contribution to this Special Issue because of its focus on an established standard, which provides reliability and efficiency in crucial application areas such as military, public safety and transportation.

Finally, Lehner et al. focus on railway traffic and propose the design of a vehicular *ad hoc* communication system for safety of life applications. In particular, they consider a many-to-many communication system with the boundary conditions specific to railway environment including limited communication range, high speeds, high user densities and high interference.

We are grateful to Prof. Athanasios Vasilakos, Dr. Mohammed Dorgham, Ms Liz Harris, and the authors who contributed papers for this Special Issue, the participants of the Nets4Cars 2009 and Nets4Cars 2010 events, the Nets4Cars organising committee and the technical programme committee for their contributions in making this Special Issue a possibility. We hope that this Special Issue on communication technologies for vehicles

will serve as a valuable resource in this area for academics and practitioners. As we are writing this editorial, we have successfully held the third annual event, Nets4Cars 2011, in the German Aerospace Centre, Oberpfaffenhofen, Germany, and we are looking forward to organise Nets4Cars 2012. We invite you to contribute to the Nets4Cars 2012 and look forward to see you during the next event.