9.30 ***Reliable and scalable vehicular networking for cooperative automated driving***

Abstract:

Fully automated autonomous driving is limited by the sensing capabilities of future vehicles. A key element for automated driving will be to increase the situational awareness of vehicles by means of communication with other vehicles. Furthermore, communication capabilities can be used to achieve consensus among cars for coordinated manoeuvres. In past analyses and experiments, it has been shown that the reliability and scalability of vehicular networking will be a limiting factor in future cooperative automated driving. In this presentation, I will discuss and analyse three directions to address these limitations. First, I will discuss and analyse an approach to make geocasting more reliable. Next, I will discuss ideas to scale up geocasting to such an extent that we would have Internet-wide geocasting. Finally, I will discuss and analyse an approach for vehicles to achieve reliable consensus for coordinated driving in the presence of packet losses.

Geert Heijenk, University of Twente, the Netherlands

Bio:

Geert Heijenk is an associate professor at the University of Twente, the Netherlands. He is also program director of the Computer Science and Internet Science & Technology bachelor and master programs of University of Twente. Between 1995, when he obtained his Ph.D., and 2003, he was working for Ericsson EuroLab, Netherlands, leading a networking research group. Geert Heijenk is steering committee member of WWIC and IEEE VNC. He has been a visiting researcher at the University of Pennsylvania, Philadelphia, and a visiting professor at the University of California, Irvine, and INRIA, Rocquencourt. His area of research is wireless networking. He is particularly interested in architectures, algorithms, and protocols for cellular, ad-hoc, sensor, and vehicular networks.

11.00 ***A Simulation Framework for V2V Wireless Systems***

Abstract:

To evaluate vehicle-to-vehicle communication performance, a good simulation framework is needed. In this talk we present an event driven simulation framework based on OMNeT++ and an additional vehicular network module, Veins. The framework allows importing GPS routes from measurements to compare the performance of simulated routes directly with measured ones. We also present improvements to the propagation model to capture more realistic shadowing behavior from other vehicles.

Christian Nelson, Lund University

Bio:

Christian Nelson received his M.Sc. degree in Engineering Physics from Lund University 2016. From 2013 through 2015 he was employed by the Swedish Defense Research Agency (FOI) where he worked with electronic warfare simulations and evaluation. Since 2016 he holds a position at Lund University as Ph.D. student at the department for Electronic and Information Technology (EIT), Lund University. His research interests are vehicular communications and electromagnetic wave propagation.

13.00 ***Frame-Asynchronous Coded Slotted ALOHA for Vehicular Communications***

Abstract:

We consider a frame asynchronous coded slotted ALOHA (FA-CSA) system for uncoordinated multiple access, where users join the system on a slot-by-slot basis according to a Poisson random process and, in contrast to standard frame synchronous CSA (FS-CSA), users are not frame-synchronized. Previously we have shown that the all-to-all broadcast version of FS-CSA is able to support a much larger number of users than carrier sense multiple access (CSMA), the current multiple access protocol in vehicular networks. By deriving the density evolution and tight approximations of the finite frame length performance, we show that in general FA-CSA provides better packet loss rate in both the EF and waterfall regions as compared to FS-CSA. Moreover, FA-CSA exhibits better delay properties than FS-CSA. Since FA-CSA is better than FS-CSA in terms of both packet loss rate and delay makes it a perfect candidate to replace CSMA for vehicular communications.

Fredrik Brännström, Chalmers University of Technology

Bio:

Fredrik Brännström received the M.Sc. degree in electrical engineering from Luleå University of Technology, Luleå, Sweden, in 1998, and the Lic.Eng. and Ph.D. degrees in communication theory from the Department of Computer Engineering, Chalmers University of Technology, Gothenburg, Sweden, in 2000 and 2004, respectively. In 2012, he received the Docent degree in Communication Systems from the Department of Signals and Systems, Chalmers University of Technology. From 2004 to 2006, he was a Post-Doctoral Researcher with the Communication Systems Group, Department of Signals and Systems, Chalmers University of Technology. From 2006 to 2010, he was a Principal Design Engineer with Quantenna Communications, Inc., Fremont, CA, USA. In 2010, he joined the Department of Signals and Systems, Chalmers University of Technology, where he is currently a Professor in the Communication Systems Group. His research interests in communication and information theory include code design, coded modulation, labelings, and coding for distributed storage, as well as algorithms, resource allocation, synchronization, and protocol design for vehicular communication systems. He is a recipient of the 2013 IEEE Communication Theory Workshop (CTW) Best Poster Award and a coauthor of the paper that received the 2016 IEEE Sweden VT-COM-IT Joint Chapter Best Student Conference Paper Award. In 2014, he received the Department of Signals and Systems Best Teacher Award

13.30 ***Platooning Enabled by ETSI ITS-G5 Communications: Fuel Efficiency Analysis***

Abstract:

We evaluate the performance of platoon enabled by contemporary ITS-G5 vehicular communications through a number of simulation experiments. We assess platooning fuel consumption performance under two communication setups and estimate the potential influence of the communication system on the efficiency of the platooning. We also make an attempt to transform our results on platoon fuel efficiency into potential cost reduction gain. Our study shows that platooning fuel-efficiency may vary depending on the communication setup.

Alexey Vinel, Halmstad University

Bio:

Alexey Vinel (M'07-SM'12) is a Professor of Computer Communications with the School of Information Technology, Halmstad University, Sweden. He received his Bachelor's (Hons.) and Master's (Hons.) degrees in information systems from Saint-Petersburg State University of Aerospace Instrumentation, Russia, in 2003 and 2005, respectively, and the Ph.D. degrees in technology from the Institute for Information Transmission Problems, Russia in 2007 and Tampere University of Technology, Finland in 2013. His research interests include vehicular networking, cooperative intelligent transportation systems and autonomous driving. He has been an Associate Editor of IEEE Communications Letters since 2012, IEEE Wireless Communications since 2015 and IEEE Transactions on Dependable and Secure Computing since 2016.

14.00 ***C-ITS Deployment in Europe - Current Status and Outlook***

Abstract:

Cooperative Intelligent Transport Systems (C-ITS) refers to applications using vehicle-to-vehicle and vehicle-to-infrastructure communications at a carrier frequency of 5.9 GHz to increase road traffic safety and road traffic efficiency in Europe (a.k.a. connected vehicle technology in the US). This presentation will shed some light on the current status of C-ITS in Europe and what is left before deployment can commence in 2019 as announced by C2C-CC. Even though there is an immense activity for the launch of C-ITS in Europe, the automotive industry is also planning for the future.

Katrin Sjöberg, Volvo Group Trucks Technology

Bio:

Katrin Sjöberg works as connected vehicle technology specialist at Volvo Group Trucks Technology in Göteborg, Sweden. She is working with wireless access to the vehicle both short-range technologies (e.g., 802.11p, WiFi, Zigbee) as well as long-range technologies (e.g., 3G/4G) for connecting the vehicle. Her research interest ranges from channel modeling to applications for the vehicular environment. She is actively contributing to vehicle-to-vehicle standardization in SAE DSRC Technical Committee in the US and within ETSI Technical Committee on ITS in Europe, where she is also holding a vice chairmanship of working group 4. Further, she is actively participating in the different working groups in the CAR 2 CAR Communication Consortium. In April 2013, she defended her PhD thesis "Medium Access Control for Vehicular Ad Hoc Networks" at Chalmers University of Technology.

15.00 ***Handover of Safety-critical Autonomous Driving Functions: From Theory to Practice***

Abstract:

As autonomous systems, control and communications converge, many new challenges are arising in the design of future communication systems, especially in the context of safety-critical applications. Over the last years, the focus has been on drastically reducing latencies as well as increasing the reliability of the wireless front-end itself, with many promising solutions now entering the discussions. With these solutions in place, the focus swings now more to the end-to-end perspective, and the integration of safety-critical applications into networked infrastructures. Future networks will have to maintain a notion of the running control process, and adapt resources accordingly. In this task we present theoretical and practical challenges to these issues in the context of autonomous driving. Assuming the task of platoon coordination as an example, we present a theoretical approach how to connect the communication system performance with the control level, exemplified in the context of a handover decision. We show that the state of the plant, in this case the state of the platoon, has a significant impact on the handover decision, and discuss finally practical implementations that can realize the handover depending on the system architecture.

James Gross, KTH – Royal Institute of Technology

Bio:

James Gross received his Ph.D. degree from TU Berlin in 2006. From 2008-2012, he was assistant professor and head of the Mobile Network Performance Group at RWTH Aachen University, as well as a member of the DFG-funded UMIC Research Centre of RWTH. Since November 2012, he has been with the Electrical Engineering School, KTH Royal Institute of Technology, Stockholm, as an associate professor. He also serves as vice-director for the ACCESS Linneaus Centre and is a member of the board of KTH's Innovative Centre for Embedded Systems. His research interests are broadly in the area of mobile systems and networks, with a focus on critical machine-to-machine communications, cellular networks, resource allocation, as well as performance evaluation methods (in particular stochastic network calculus as well as network simulation). He has (co-)authored over 100 (peer-reviewed) papers in international journals and conferences. His work has been awarded multiple times, including the best paper awards of ACM MSWiM 2015, IEEE WoWMoM 2009 and European Wireless 2009, as well as the Best Demo Paper Award of IEEE WoWMoM 2015. In 2007, he was the recipient of the ITG/KuVS dissertation award for his Ph.D. thesis. Apart from his academic work, he has been founder of the spin-off R3 Communications, a Berlin-based start-up in the area of critical industrial wireless networking.

15.30 ***The Grand Cooperative Driving Challenge – Some hints from the winning team***

Abstract:

Short-range wireless communication is what enables vehicles to form platoons, a.k.a. road trains. Platooning is probably the application that puts up the highest requirements on connected automated vehicles because of the close distance between vehicles. Platooning is very appealing due to the promising fuel savings that can be achieved but also due to the reduction in CO2 emissions. However, platooning is also so much more than just communication. Platooning challenges many areas such as functional safety, liability, human machine interface, communication, road infrastructure, control of the vehicle, etc. Modern vehicles have several sensors onboard that are used for active safety functions such as automatic breaking but also for more comfort-like features such as adaptive cruise control. By connecting the active safety functions with cooperative intelligent transport systems more tighter the full potential of connected automation can be explored and platooning can become a reality.

Víctor Díez Rodríguez, Halmstad University and Segula Technologies

Bio:

Víctor Díez Rodríguez is currently a Consultant Engineer at Segula Technologies. He completed his Bachelor Degree in Computer Science at University of Burgos, Spain, in 2014. In 2016, he received his Master Degree in Embedded and Intelligent Systems from Halmstad University, Sweden. He was part of Team Halmstad during the Grand Cooperative Driving Challenge 2016. His main interests are vehicular communication and software engineering.