2017

COMMUNICATIONS SYSTEMS INTEGRATION AND MODELING TECHNICAL COMMITTEE (CSIM-TC)

NEWSLETTER

Christos Verikoukis (Chair)
Burak Kantarci (Vice-chair)
Nizar Zorba (Secretary)

Table of Contents

ABOUT CSIM

The Communications Systems Integration and Modeling technical committee focus its activities on simulation, analytical tools and measurement of communications links and networks. CSIM has been sponsoring activities on traffic modeling, performance and integration of next generation wireless and wireline networks.

CSIM sponsors its traditional bi-annual workshop CAMAD, as well as special issues in the IEEE Communications Magazine and in the IEEE Journal on Selected Areas in Communications. CSIM is very active in ICC and in GLOBECOM and was one of the co-founders of MILCOM. CSIM has its roots on the Communications Systems Engineering Technical committee and its past chairs are:

2015-now – Christos Verikoukis

2013-2015 – Stefano Giordano

2011-2013 – Harry Skianis

2009-2011 – Fabrizio Granelli

2007-2009 – Pascal Lorenz

2005-2007 – Nelson L.S. da Fonseca

2002-2005 – Mike Devetsikiotis

2000-2002 – Mohammad Ilyas

1999-2000 – Hussein Mouftah

1996-1999 – Guy Omydar

1994-1996 – Bill Tranter

For more information about CSIM, please visit: http://csim.committees.comsoc.org/

1. Short Courses / Invited Talks / Awards / Tutorials by CSIM Members

1.1 Short Course on Complex Networks and Point Processes with Applications

Organizers: Prof. J. P. Coon (Oxford) and Prof. C. P. Dettmann (Bristol)

Networked systems arise in many aspects of science and engineering. Typical examples include communication networks, electricity grids, social networks and human interactions, and models depicting the spread of diseases. Often, the behaviour of these systems is dependent upon the spatial embedding of the network. Over the past few decades, mathematicians, physicists and engineers have made great progress toward developing mathematical tools and models that can be used to analyse networks and identify ways in which to influence their properties to achieve some stated objective. In recognition of these facts, this two-day short course was designed to educate graduate students, postdocs and enthusiasts of network science in the nuances of particular aspects of complex network theory and point processes in relation to spatial network analysis. The course took place during 11–12 September, 2017 at Oriel College in Oxford. The following five lectures were given:

Traditional vs. non-traditional methods in network analytics
Ernesto Estrada, University of Strathclyde

Connection functions and connectivity
Carl P. Dettmann, University of Bristol

Entropy of deterministic networks and network ensembles
Justin P. Coon, University of Oxford

On modeling cellular networks by using inhomogeneous Poisson point processes
Marco Di Renzo, CNRS-SUPÉLEC-University of Paris-Sud XI

Multilayer networks
Ginestra Bianconi, Queen Mary University of London

The lecture slides can be downloaded at http://www.eng.ox.ac.uk/sen/events2017.html.

1.2 Second Symposium on Spatial Networks

Organizers: Prof. J. P. Coon (Oxford) and Prof. C. P. Dettmann (Bristol)

Oxford University hosted a two-day symposium focused on spatial networks from 13-14 September, 2017. The symposium brought together experts from mathematics, physics and engineering communities working on elements of graph theory, complex networks, information theory and communication theory. The following invited talks were given:

Shot-noise based spatial birth-and-death processes
François Baccelli, University of Texas at Austin

The betweenness centrality in random planar graphs
Marc Barthélemy, CEA Institut de Physique Théorique

Emergent network geometry
Ginestra Bianconi, Queen Mary University of London

Stochastic geometry modeling of cellular networks: from system-level analysis to system-level optimization
Marco Di Renzo, CNRS-SUPÉLEC-University of Paris-Sud XI

A Gillespie algorithm for simulating interacting non-Markovian point processes
Naoki Masuda, University of Bristol

In addition to the invited talks, contributions related to a number of other topics were presented. This was the second in a series of three multi-disciplinary symposia supported by the Engineering and Physical Sciences Research Council (EPSRC). This event was hosted at Oriel College (the fifth oldest college in Oxford, founded in 1326). For more information and links to slides, please visit http://www.eng.ox.ac.uk/sen/events2017.html.

1.3 UAV for Air Quality Monitoring Event in Qatar

by Dr. Nizar Zorba, (Qatar University)

The CSIM team within Qatar University (+20 members and led by Dr. Nizar Zorba) has hosted a visit from an executive from Boeing based in Qatar to discuss on recent advances in Unmanned Aerial Vehicles (UAV), and on their application for Air Quality monitoring in Qatar. On the basis of a joint project between Boeing and Qatar University, the students have developed a UAV and mounted a wide range of sensors to it. Boeing provided funding to the project as well as guidance and mentoring by Mr. John Wilson from Boeing Global Services. A detailed presentation about the current state of the art as well as the recent developments have been tackled. Then they moved to a discussion about the employed hardware and future targets to make the designed UAV more commercial and implemented in realistic systems. Many students within the IEEE students' branch attended the presentations and discussions showing high interest in the presented topics.

Sample picture from the visit

1.4 Distinguished Paper Award

By Dr. Ashraf Matrawy (Carleton University)

Prof. Ashraf Matrawy and his co-authors received a Distinguished Paper Award at ACM ASIACCS 2017, the 12th ACM Asia Conference on Computer and Communications Security. ASIACCS is the Asia version of ACM CCS. The work in the paper presented new strategies enabling adversaries to accurately control forged location while using delay-based Internet geolocation. Evaluation showed that using the new strategies, adversaries could misrepresent their true locations by over 15000km, and in some cases within 100km of an intended geographic location. The paper also discussed countermeasures to mitigate such strategies.

The paper title: **Accurate Manipulation of Delay-based Internet Geolocation** AbdelRahman Abdou (Carleton University), Ashraf Matrawy (Carleton University), Paul van Oorschot (Carleton University).

For more information, please visit http://asiaccs2017.com/program/distinguished-papers/

2. IEEE ComSoc Summer School

2.1. CSIM Contributions to the 3rd Edition of the IEEE ComSoc Summer School

Contributors from CSIM: Dr. Michael Devetsikiotis, Dr. Fabrizio Granelli, Dr. Nelson Fonseca, Dr. Ioannis Papapanagiotou, Dr. Petros Spachos

The 3rd Edition of the IEEE ComSoc Summer School was held on 17-20 July 2017 at the University of New Mexico. The event was hosted by the ECE Department of the University of New Mexico. Professor Michael Devetsikiotis has been the local organizer of the event.

The IEEE ComSoc summer school is designed for young professionals, Ph.D. students, or recent graduates studying communications and related areas. It consists of lectures by international experts and includes poster presentations by participating Ph.D. students. The program covered fundamental, advanced and hot topics in communications. The summer school had significant support and contributions from CSIM-TC members.

The program consisted of four program speakers and three lectures on extended hands-on and industrial program. Dr. Nelson Fonseca (University of Campinas) delivered a talk on Big Data for networking. Dr. Fonseca's talk aimed at introducing the Big Data ecosystem and how the processing of Big Data can be employed for the management and operation of wired and wireless networks. Case studies were discussed. Source of data in communication networks such as in the Internet of things and social networks were presented. Processing of Big Data as well as Cloud and fog computing were introduced. Moreover, the role of virtualization in the support of processing and communication of Big Data were explained.

Dr. Fabrizio Granelli (University of Trento) delivered a talk on Virtualization at the Service of Communications. Dr. Granelli first reviewed the basic concepts related to virtualization, then focused on the Software Defined Networking and Network Function Virtualization paradigms. After reviewing the basic concepts related to

OpenFlow as an example of protocol for SDN, some test cases of virtualization in communications were reviewed and especially those related to the upcoming 5G cellular network. A suitable network emulation software was introduced to provide a basic hands-on session on the SDN/OpenFlow paradigm.

Dr. Ioannis Papapanagiotou (Netflix) contributed to the extended hands-on and industrial program with a lecture on “Microservices at Scale - Principles, Tradeoffs & Lessons Learned”. Netflix's streaming service is based on a cloud-native architecture. It is able to deliver speed, scalability, and security through automation of continuously delivered single function microservices. The core components of Netflix's stack has been open sourced, making it one of the most open and battle-proven stacks used by numerous companies. Dr. Papapanagiotou covered explicit technology choices they made for all of the microservices to work well together, and the lessons learned of things that don't work well. He described the organizational structure inside of Netflix that creates common development, runtime, and operational aspects of microservices. Dr. Papapanagiotou discussed how microservices impacted Netflix product development with regards to agility, choice, and standardization. Finally, he summarized where they are now, including an overview of our open source technologies, and where they are heading in the future.

Dr. Petros Spachos (University of Guelph) contributed to the extended hands-on and industrial program with a lecture titled Proximity Beacons in Smart Cities - Applications, Challenges and Research Opportunities. Beacons are small devices that can broadcast signals at a certain interval in order to allow applications to understand their location and sends signals to users based on the location. The uses of beacons in the real world are extremely diverse and endless. Dr. Spachos covered a number of applications that beacons are used in smart cities. He described the requirements that are needed for indoor localization with beacons and the challenges they face when deployed in smart cities. Finally Dr. Spachos summarized with the research opportunities with beacons and a demonstration of their use with a smartphone application.

Further information at: https://www.comsoc.org/summer-school/program

3. Upcoming Events

3.1.ITC 30: Teletraffic in a Smart World

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The International Teletraffic Congress ITC 30, to be held September 3-7, 2018, at the University of Vienna, Austria, is the 30th edition of this international flagship congress in the field of networking science and practice. ITC was founded back in 1955 by enthusiastic scientists and engineers who were willing to deploy networks in a holistic way. Since then, it has established a multi-decade tradition as the primary forum for presenting and discussing the latest technical advances in the broad areas of teletraffic models, network systems, and measurements.

For ITC 30, cutting-edge papers spanning both theory and experimentation are solicited in all areas of networking, ranging from traffic engineering and control with application also to emerging softwarized/virtualized network paradigms, up to innovative wireless scenarios brought about by the emergence of 5G and IoT systems. We especially encourage original contributions which bridge the gap between performance modeling and real-life operational aspects, including works which leverage measurement data to provide a better understanding of the wired and wireless networks' operation under realistic conditions.

ITC 30 is specifically organized into four (partially overlapping) areas.

- Area 1: Performance Evaluation, Control and Optimization
  Chairs: Sem Borst, Markus Fiedler, Bruno Tuffin
- Area 2: Network Measurements and Big Data
  Chairs: Oliver Hohlfeld, Fabián Bustamante, David Malone
- Area 3: Networking Architectures and Paradigms
  Chairs: Andreas Kassler, Stefano Secchi, Roberto Bifulco
- Area 4: Wireless and Cellular Networks
  Chairs: Steven Latre, Albert Banchs, Shiwen Mao

ITC 30 has set up several prestigious awards, including a Best Paper Award and a Best Student Paper Award. These awards are based both on the scientific quality of the paper and the quality of the oral presentation. Moreover, several Student Travel Grants will be available. In addition, the congress will also host associated workshops as well as exciting social events, including

- City Tour, Reception and Opera Recital on Sept 4, Palais Eschenbach
- Mayor's Reception and Gala Dinner on Sept 5, Vienna City Hall

Looking forward very much to welcoming you at ITC 30 in Vienna 2018!!!

Peter Reichl, Tobias Hoßfeld *(General Chairs)*

Eitan Altman, Giuseppe Bianchi, Thomas Zinner *(TPC Chairs)*

The submission deadline is March 1, 2018. More information is online at https://itc30.org/

4. Ongoing Research projects

4.1. Smart Infrastructures for Safe and Prompt Crowd Management

By Dr. Nizar Zorba (Qatar University)

Qatar will be hosting the World Cup 2022, and with such a large-scale event, effective and efficient organization is of paramount importance. Crowd management will be crucial to deal with the influx of people and cars that will be hosted. The large volume of people and cars is not a one-time occurrence though. In recent years, we have witnessed a massive increase in both expanded urbanization as well as migration to urban areas. In turn, urban areas have become prone to recurring instances of congestion and accidents, both in daily commutes or in the occasional gatherings (sport events, World Cup 2022, national holidays, etc.). Despite great technological advances, crowd management in urban settings has mostly relied on either traditional, non-automated mechanisms or spontaneous notifications/alerts through social networks. Such management techniques are heavily marred by the lack of comprehensive control, especially in terms of averting risks in a manner that ensures crowd safety and enables prompt emergency response.

The objective of this project is to realize a smart infrastructure that is directly aimed at crowd management. A key emphasis in the project is the robust and reliable scalability that provides sufficient flexibility to manage a mixed crowd (i.e.., pedestrian, cyclers, manned and unmanned vehicles). The infrastructure also spans various population settings (e.g.., roads, buildings, game arenas, etc.). A foundational approach is adopted with a clear and practical aim of a large-scale product prototyping and implementation.

At the core of the smart infrastructure realization is a closed-loop sense-process-act cycle. This core relies heavily on state-of-the-art advances in sensing, computing and telecommunications/networking, and proceeds with considerations for both evolutionary setups (i.e.., smartening-up traditional infrastructures) as well as new infrastructure implementations. A testbed will be developed and implemented for actual inputs from realistic systems in Qatar, both in Doha and Lusail cities. The project partners are Qatar University (Qatar) and Queen’s University (Canada).

4.2. 5G STEP FWD: 5G System Technological Enhancements Provided by Fiber Wireless Deployments

By Dr. John Vardakas (Iquadrat) and Dr. Christos Verikoukis (CTTC)

Participants: Centre National de la Recherche Scientifique (France), Centre Tecnològic Telecomunicacions Catalunya (Spain), Kungliga Tekniska Högskolan (Sweden), Aristotle University of Thessaloniki (Greece), Technische Universiteit Eindhoven (Netherlands), OTEacademy (Greece), III-Vlab (France), Siae Microelettronica (Italy).

5G STEP-FWD is a H2020 Innovative Training Network (ITN) project, recently launched on June 2017. 5G STEP-FWD is currently recruiting 15 Early Stage Researchers (ESRs), in order to create a fully integrated and multi-disciplinary network that will design, analyze and optimize a new network architecture that targets to achieve high capacity and low latency backhauling by utilizing the ultra-dense wavelength division multiplexing (UDWDM) optical technology. The 5G STEP-FWD consortium comprises of 3 Universities, 2 Research Centers and 4 private companies, spanning across 7 European countries. The 5G STEP-FWD mission is to create a vibrant EU-based training and research environment for young European and international researchers, aiming at designing architectures, systems and algorithms for building the 5G cellular network of tomorrow.

The 5G STEP-FWD project aims to overcome the limitations for the backhaul that stem from the deployment of mmWave HetNets. Specifically, the 5G STEP-FWD proposes a new network architecture that uses UDWDM PONs as the backhaul of mmWave networks in the radio access network. The proposed architecture takes full advantage of the ultra-narrow wavelength spacing of the UDWDM technology, in order to provide connectivity to a dense small-cell population. 5G STEP FWD proposes the connection of small cells to different PONs through i) fiber links between two Optical Line Terminals (OLTs), ii) point-to-point fiber links, iii) small-scale fiber protection rings among locally adjacent Optical Network Units (ONUs).

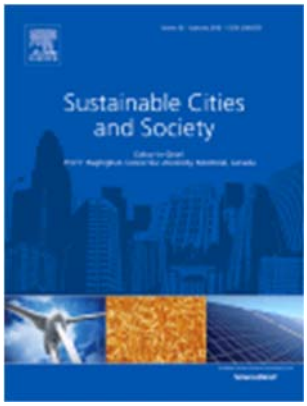
At the physical layer domain, 5G STEP FWD aims at providing a comprehensive framework based on a disruptive device- or user-centric cellular concept, which will allow smart overlaid peer-to-peer communications, while it will also optimally allocate small cells where the fiber goes. At the same time, localinterference awareness, advanced beamforming design and caching awareness are concepts that can overcome the operational limitations stemming from the fact that the serving access point is chosen based on link quality rather than on the actual load or backhaul availability, and will provide the means for the development of new association strategies based on the resource availability of the converged network. At the network layer domain, the modelling and optimization of the 5G STEP FWD network resource usage is envisioned through the incorporation of a Software-Defined-Network

(SDN) framework, which integrates multiple wireless and backhaul resources into a single pool, and could play a key role in supporting multi-tenancy and enabling the network operation management and optimization. The application of novel Medium Access Control (MAC) protocols, which can be adjustable when applied to a network of interconnected UDWDM PONs, will complement the SDN operation for the provision of i) enhanced service differentiation with reduced latency and congestion, and ii) improved throughput and higher robustness over transmission errors.

5. Special Issues Edited by CSIM members

5.1. Virtual Special Issue on Emergence of Smart Embedded Devices towards Smart Global Village (Elsevier Sustainable Cities and Society)

By Dr. Burak Kantarci (University of Ottawa)



An embedded device is a special purpose dedicated computing system enclosed by a larger mechanical or electrical object that may or may not is connected to the Internet. Change is afoot with an exponential curve in the world of embedded systems that was initiated with basic silicon building blocks (wireless MCUs, MEMS, low-power RF ICs, nano-amp microcontrollers, RTOS and CMOS-based sensing devices,) and is pacing up with silicon photonics apart from molecular, supramolecular and quantum technologies. Assisting to it is the incorporation of intelligence through solutions from a long and innovative list of computational intelligence domain (swarm intelligence, neural networks, artificial intelligence, fuzzy logic, and genetic algorithms), Deep Learning, Machine learning, and their state-of-the-art extensions. This emulsifying integration is making stronger and smarter underpinning especially for IP-enabled devices, M2M communication, Cloud Computing, Big Data, RFID, White Space TV Spectrum, iPhone Apps and WSNs. In addition to this, the intelligence in complex technical systems including manufacturing systems, power systems, audio-video equipment, climate control systems, manufacturing systems, telephones, vehicles, toys, aircraft, medical diagnostics, and security systems are constituting of smart embedded systems as their key technological components. These represent a compelling opportunity across a staggering array of applications covering homes, supply chains, offices, factories, healthcare systems and hospitals, metro infrastructure, agriculture, space, security and surveillance, entertainment, avionics, logistics and transportation to make life easier, safer, and greener for millions of people in this smart global village. The trend in a current undaunted spree of embedded devices' integration with state-of-the-art technologies is now towards the loosely-coupled decentralized type of system (e.g. Internet of Things) that is leading to an autonomous physical system with sensing/actuating, data processing, decision making, and storing functionalities. This is further opening up a new horizon of challenges, and applications as well.

This special issue focuses on the enthusiastically emergent role of embedded devices equipped with intelligent designarchitecturealgorithms to transform the Global Village into Smart Global Village and its associated challenges. Submissions could consist of novel ideas, original results, theoretical and applied research in following topics, but not limited to

- Hardware and software design (privacy, security, safety, dependability, and reliability)
- Prototyping of Experimental System (simulation and real implementation)
- Test (embedded test, SOC, built-in self-test, test synthesis)
- Energy (harvesting, scavenging, efficient consumption, reliability, management)
- Operation and Maintenance (interoperability, problem identification, troubleshooting, recurrent costs)
- Self-learning (prediction, pattern discovery, auto-configuration)
- Intelligent techniques supporting embedded devices (computational intelligence, deep learning, machine learning, etc.)
- Industrial practices and benchmark suites for smart embedded devices
- Integration in IoT (smart cities, smart homes, smart transportation systems, smart grids, and smart logistics, and etc.), and other technologies
- Embedded devices and complex technical systems (manufacturing systems, power systems, audio-video equipment, climate control systems, manufacturing systems, etc.)
- Integration with communication technologies (efficient, security, resilience, low energy)

SUBMISSION GUIDELINES

Prospective authors should prepare their submissions in accordance with the guidelines specified in the Information for Authors of the Sustainable Cities and Society (https://www.elsevier.com/journals/sustainable-cities-and-society/2210-6707/guide-for-authors).

IMPORTANT DATES

- Submission Open: September 1, 2017
- Submission Deadline: March 1, 2018
- Final Decision: September 1, 2018

Guest Editors

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6. Further news

6.1. New Course on Smart Cities

By Dr. Burak Kantarci (University of Ottawa)

Burak Kantarci has developed a new topics course on Smart Cities for the Ottawa-Carleton Institute of Computer Science (OCICS) with the title "Information and Communication Systems for Smart Cities" from September 2017 to December 2017. The course is an introduction to relevant information and communication technologies (ICTs) required for coordinated, efficient cities. Three primary foci were on smart cities sensing, analytics, and information security and privacy. Topics have included: a thorough presentation of information and communication infrastructures for smart cities, namely cloud and mobile edge solutions for computing, processing and storage, detailed investigation of opportunistic and participatory sensing solutions, analytics as a service, and information security and privacy in smart cities.

An emphasis has been given on the design and analysis of Internet of Things (IoT) infrastructures, protocols and communication models; and the role of device-to-device networks in the realization of smart cities. The topics that the students have gained knowledge at the end of the term are as follows: Dedicated and non-dedicated sensing, social sensing, smart grids, smart transportation, smart environment, smart health and well-being, smart utilities, cloud analytics service model, IoT-data analytics ecosystems: Smart city analytical models, social network analytics, and biometric/behaviometric systems.