IEICE ictf2013
Information and Communication Technology Forum

IEICE Europe Section

IEICE Communications Society

The Institute of Electronics, Information And Communication Engineers (IEICE)

2013 IEICE ICTF

Information and Communication Technology Forum

May 29-31, 2013

Sarajevo, Bosnia and Herzegovina

2013 IEICE ICTF

IEICE ictf 2013
Information and Communication Technology Forum

2013 IEICE

INFORMATION AND COMMUNICATION TECHNOLOGY FORUM

Sarajevo, Bosnia and Herzegovina, 2013.

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Pending

The Institute of Electronics, Information And Communication Engineers (IEICE)

CALL FOR PAPERS

May 29-31, 2013

Sarajevo, Bosnia and Herzegovina

2013 IEICE ICT Forum

IMPORTANT DATES

Paper submission deadline:

December 10, 2012

Review Notification:

February 10, 2013

Final Manuscript due:

Topics

- ◊ 4G and beyond wireless systems;
- ◊ next-generation access technologies, management, diagnostics and troubleshooting of communications network;
- ◊ performance measurements, experimental platforms and testbeds;
- ◊ internet of things and next-generation networks, machine type communication;
- ◊ cloud computing and architectures;
- ◊ green communications models, architectures, and networking solution;
- ◊ security and privacy in next-generation network;
- ◊ healthcare and medical applications;
- ◊ optical communications and next-generation GPON, integration of optical and wireless access as a last mile;
- ◊ power line communication and smart grid;
- ◊ image and signal processing, digital coding and filtering ;
- ◊ system and software design and optimization;
- ◊ analog & mixed signal circuits;
- ◊ biomedical/bioengineering circuits and systems;
- ◊ RFIC and mm Wave;
- ◊ circuits & systems in emerging technologies;
- ◊ opto & nano electronics, integrated circuits & devices;
- ◊ VLSI systems, applications and computer aided network design;

PAPER SUBMISSION GUIDELINE

Presented paper will be included and indexed in the IEICE digital libary (I-Scover). The authors should follow the guidelines for authors at www.ieice-europe.org/ictf when preparing their contributions. Please send any questions to: ictf@ieice-europe.org

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FOREWORD

HARIS GACANIN,

Alcatel-Lucent Bell

IEICE Europe Section, Chair

It is my great pleasure to welcome you to the 2013 IEICE Information and Communication Technology Forum (ICTF) on behalf of the ICTF Organizing Committee, to be held in Sarajevo, Bosnia and Herzegovina during 29th to 31st of May 2013. In the era of mobile Internet, technology is inevitably becoming crucially important and is taking significant part in our daily lives. Tremendous effort is being made by the giant IT companies in order to develop and present a new breakthrough product which will find its customers and change our habits. However, to get to that point a huge amount of work has to be done and problems to be solved from algorithms to networking issues and services.

ICTF will provide an opportunity for researchers and engineers to stress the main technological issues mainly in the area of electronics, engineering and communications, and address the hottest topics while merging the knowledge and experience from both academia and industry worlds. The Forum will consists of two parts; (1) Keynote Speeches will be provided by recognized professors and industry experts in a form of tutorial presentations, (2) Invited Speeches provided by experienced researchers and professors, and (3) Technical Paper presentations based on the accepted technical papers.

I wish you all a very pleasant stay in Sarajevo and a very successful Forum.

Sincerely,
Haris Gacanin

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KEYNOTE SPEAKERS

INTER-INDUSTRY INNOVATION

DR YUJI INOUE

THE PRESIDENT, THE INSTITUTE OF ELECTRONICS, INFORMATION AND COMMUNICATION ENGINEERS

THE CHAIRMAN OF THE BOARD, TOYOTA INFO-TECHNOLOGY CENTER, CO. LTD.,

Possible solution for new issues is to change the industry formation from competition basis to collaboration basis not only within a industry but among different industries, especially improve the primary industry such as agriculture and fishery by ICT support.

Riemann shock & EU risk demonstrate that the world is saturated in current economical system and needs a new paradigm for evolving people and society further with more than 7 billion population. Another aspect is the recurrent disasters which indicate that the world is limited in natural resources and needs a new wisdom. A possible solution for these new issues is to change the industry formation from competition basis to collaboration basis not only within a industry but among different industries, especially improve the primary industry such as agriculture and fishery by ICT support. Some examples in the primary industry & ICT will be presented together with the case of automobile &ICT.

Yuji Inoue was born in 1948 in Fukuoka, Japan. He received the B.E., M.E. and Ph. D degrees from Kyushu University, Fukuoka, Japan, in 1971, 1973 and 1986, respectively, and was made an Honorary Professor of the Mongolian University of Science and Technology in 1999.

He joined NTT Laboratories in 1973 and served there for 34 years. While he was in NTT, he was active in ITU-T standardization on ISDN (Integrated Services Digital Network), SDH (Synchronous Digital Hierarchy) and TNA (Transport Network Architecture) during 1982 – 1992. After new business development in NTT Data, he was a board member of NTT in 5 years as CTO and the head of NTT group's R&D with 6000 researchers and engineers.

He moved to The Telecommunication Technology Committee, TTC in 2007 as the President and CEO, then to Toyota IT Development Center. He is currently the Chairman of the Board. He is a fellow of IEICE and IEEE and is currently President Elect of IEICE. He wrote and edited many technical books.

DISASTER-RESILIENT MULTILAYERED COMMUNICATIONS NETWORK

PROFESSOR FUMIYUKI ADACHI,
TOHOKU UNIVERSITY, JAPAN

Following the Great East Japan Earthquake, Ministry of Internal Affairs and Communications of Japan initiated many R&D programs to establish new communication system in the case of a disaster or emergency. In this talk, some details concerning the "multilayered communication network" will be presented.

Learning from lessons of The Great East Japan Earthquake in March 2011, MIC (Ministry of Internal Affairs and Communications) of Japanese Government initiated many R&D programs in order to establish new communications systems which are robust, resilient, and dependable in case of disaster and emergency. Our proposed project "Multilayered communications network" was accepted. In this talk, the concept of "Multilayered communications network" will be introduced. R&D subjects of the project will be presented and some experimental results will be shown.

Fumiyuki Adachi received the B.S. and Dr. Eng. degrees in electrical engineering from Tohoku University, Sendai, Japan, in 1973 and 1984, respectively. In April 1973, he joined the Electrical Communications Laboratories of Nippon Telegraph & Telephone Corporation (now NTT) and conducted various types of research related to digital cellular mobile communications. From July 1992 to December 1999, he was with NTT Mobile Communications Network, Inc. (now NTT DoCoMo, Inc.), where he led a research group on Wideband CDMA for 3G systems. Since January 2000, he has been with Tohoku University, Sendai, Japan, where he is a Professor of Electrical and Communication Engineering at the Graduate School of Engineering. In 2011, he was appointed a Distinguished Professor. His research interests include wireless signal processing for wireless access, equalization, transmit/receive antenna diversity, MIMO, adaptive transmission, and channel coding.

He is an IEEE Fellow and an IEICE Fellow. He was a recipient of the IEEE Vehicular Technology Society Avant Garde Award 2000, IEICE Achievement Award 2002, Thomson Scientific Research Front Award 2004, Ericsson Telecommunications Award 2008, Telecom System Technology Award 2010, and Prime Minister Invention Award 2010.

MODELLING TRAFFIC CONTROL MECHANISM IN MOBILE NETWORKS

PROFESSOR MACIEJ STASIAK,
POZNAN UNIVERSITY OF TECHNOLOGY, POLAND

Since the first attempts to develop systems with the voice connection in the 2G mobile network - GSM (Global System for Mobile Communications) in 1991, the indisputable success of cellular networks has not been questioned. Modern cellular networks enable their users to have access to the internet as well as to multimedia services. First 4G networks are being currently set up that are entirely based on IP (Internet Protocol) technologies.

The problems that emerge in designing of modern cellular networks, and, in particular, mobile networks that service multi-service traffic, i.e. 3G networks and, in the near future, 4G networks that would guarantee an acceptable level of the quality of service of calls, clearly indicate the need for developing effective and efficient methods for their optimization, dimensioning and traffic load evaluation. The process of dimensioning of mobile networks makes it possible to determine the appropriate capacities of the system that ensure -- with the pre-defined load of the system --the assumed level of GoS (Grade of Service) and QoS (Quality of Service). At the stage of dimensioning of the system, it is also necessary to take into consideration mutual dependencies between call service processes in the core network and the access network, as well as in individual elements of the access network, such as the UMTS system (Universal Mobile Telecommunication System), the WCDMA radio interface (Wideband Code Division Multiple Access) and the Iub interface.

Radio interfaces and other interfaces of the access network in 2G, 3G and 4G systems are crucial in establishing the traffic effectiveness of the network. Due to the low capacity of the radio interface, additionally limited by the influence of interference from neighbouring calls and the capacity and the organization (resources) of combined "non-radio" interfaces, network operators are to make use of a number of traffic management mechanisms that make it possible to increase the effectiveness of the systems. These mechanisms include the threshold and non-threshold compression, partial limitation of resources for preselected service classes and overflow of part of traffic caused by privileged traffic, priorities for preselected services or groups of subscribers, optimum allocation of connections in a group of cells, overflow mechanism in neighbouring cells and cells that belong to other networks of a given operator that cover a given area (e.g., from cells of a 3G network to cells of a 2G network), multicast service availability (also know as "multicast" connections) at the so-called technological level (the subscriber does not know that the connection that is being just executed is a multicast connection, e.g. as a result of a transfer of connections between cells), and the availability of servicing multicast connections at the service level (an executed connection is defined as a multicast connection within the context of a given service, e.g., conference connections).

The construction of appropriate models of cellular systems that would include both servicing a mixture of traffic with different properties and different GoS requirements, and also traffic management mechanisms in appropriate interfaces of the access network, undoubtedly influences the development of traffic theory within the domain of multi-service systems, while in the practical dimension it makes it possible to evaluate properly the traffic load in cellular networks and their efficient dimensioning and optimization.

In the key-note speech addresses the issues of analytical modelling of interfaces in the radio access network. In the first part of presentation the way of representation of multi-service traffic in multi-rate switching networks, with a particular attention given to the method of the so-called bandwidth discretization are presented. It next part the basics of modelling of interfaces of the radio access network with built-in traffic management mechanisms will be discussed. Than the most important traffic management mechanisms used in radio access networks will be shown. Finally, problems stemming from the introduction of the LTE (Long Term Evolution) technology and Advanced LTE technology to cellular networks are presented and discussed.

Prof. Maciej Stasiak received MSc and PhD degrees in telecommunication from the Institute of Communications Engineering, Moscow, Russia, in 1979 and 1984, respectively. In 1996 he received DSc degree (habilitation) from Poznan University of Technology in telecommunication. In 2006 he was nominated as full professor. Between 1983-92 he worked in Polish industry as a designer of electronic and microprocessor systems. In 1992, he joined the Institute of Electronics and Telecommunications Poznan University of Technology. He is currently a head of the Chair of Communications and Computer Networks at the Faculty of Electronics and Telecommunications at Poznan University of Technology.

Prof. Maciej Stasiak is the author or co-author of 5 books and more than 200 scientific papers, which have been published in scientific journals and presented at national and international conferences. He is engaged in research and teaching in the area of performance analysis and modeling of multi-service networks and switching systems, in particular, resource allocation, call admission control, quality of service, multi-rate systems and queuing systems. He was a supervisor of 6 PhD dissertations and about 50 MSc projects. Prof. Maciej Stasiak is a Member of Communications Society, Institute of Electrical and Electronics Engineering, a Member of Communications Society, Institute of Electronics, Information and Communication Engineers, and a Member of Association for Computing Machinery.

Prof. Maciej Stasiak has been involved in many national and international projects dealing with network and resources optimization. Since 2004 he has been actively carrying out research on modeling and dimensioning cellular networks 2/3/4G. The relevant research results obtained so far have been implemented in software used by cellular operators to handle tasks such as the analysis of the capacity and optimization of the 2/3G/4G network (he is co-author of book: Modeling and Dimensioning of Mobile Networks: From GSM to LTE, From GSM to LTE published by Wiley).

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INDUSTRY SPEAKERS

RAN CAPACITY INCENSEMENT IN SMARTPHONE ERA; SCENARIO AND TECHNOLOGIES

DR HIDETOSHI KAYAMA,
DOCOMO BEJING LABS CO. LTD., CHINA

The paradigm shifts caused by smartphones brings two aspects to mobile communications. One aspect is a "chance" for mobile operators and OTT players to easily provide new value added services by using customized applications on the common platform. Another aspect is a "risk" of mobile operators suffering drastic incensement of data traffic. Some reports say that total amount of traffic will increase up to hundreds times within a decade.

To cope with such a traffic explosion, now mobile operators are facing big challenges. In this presentation, expected scenarios and some key technologies for that problem are introduced.

Traffic offloading by WiFi is one of an effective way to reduce the traffic burden on mobile network. Currently many mobile operators are actively constructing WiFi hotspots in public places. Thanks to the common frequency band (ISM band) usage, cost of WiFi equipment is very low. While in general, its coverage area is very limited, and almost no mobility is supported in reality. In this sense, WiFi offload seems to be effective in nomadic computing, but not enough to accommodate all mobile traffics.

Small cell enhancement based on LTE-A is considered as a promising way to enhance the network capacity. By further exploiting space domain, it is expected to increase network capacity about 7 times than macro-cell systems. In contrast with WiFi, it employs centralized control manners which enable effective mobility support and interference mitigation. In addition, interworking with macro cell is also easier than WiFi, thus seamless connectivity and small amount of hand-over signaling can be expected.

From radio access technologies' points of view, advanced interference mitigation and non-orthogonal multiplexing are likely to be key issues for future systems. Currently 1-cell frequency reuse is used for effective radio resource assignment.

In addition, small cells make a distance between a base station and terminals shorter than macro systems. Thus the capacity of RAN can be said as 'interference limited'. Fortunately, coordinated multi-point transmission (CoMP) mechanism has already applied in LTE-A. By enhancing the CoMP to such a HetNet environment, further improvement of SINR (Signal to Interference and Noise) can be expected.

Non-orthogonal multiple access (NOMA) is investigated as a potential technologies for capacity improvement. It can be regarded as one kind of MUD (Multi-User Detection), but instead of signal spreading, it exploits power difference for signal separation. That is, a strongest signal is detected first, then eliminated it from original signal by applying SIC (Sequential Interference Cancelation) , thus the second stronger signal is detected in the next stage. By an initial performance evaluation, more than 30% improvement in overall cell throughput was observed.

Hidetoshi Kayama received the B.E., M.E. and Ph.D. degrees from Kyoto University in 1987, 1989 and 2004, respectively. He has been with NTT Radio Systems Laboratories since 1989, working on research of packet radio access protocols for cellular and wireless LAN. Since 1998, he was with NTT DoCoMo, Inc., where he engaged in the development of PHS cell station and research of MAC protocol for 4G mobile communication systems. Since 2004, he was a director of Lab in DOCOMO Beijing Communications Laboratories Co., Ltd. in China. From 2010 to 2012, he leaded a national research project of cognitive radio technologies which was organized by MIA, Japan. Now he is the President and CEO of DOCOMO Beijing Labs. He received the Scholarship Encouragement Award in 1995 from IEICE, Best Paper Award of ICT2002, APCC2008, APCC2012, and ICCTA2009 respectively.

INNOVATION ON M2M COMMUNICATION SYSTEMS FOR FUTURE SMART COMMUNITY

DR SHINICHI BABA
TELECOMMUNICATIONS RESEARCH LABORATORY,
TOSHIBA RESEARCH EUROPE LIMITED

Aging of population, energy waste, disaster, etc., there are so many subjects to be addressed and resolved by the community to protect the life of resident. Although there are some differences, this is the fact for all communities on the globe. In these days, Information and Communication Technologies (ICT) is widely recognised as a powerful tool to establish a solution and the smart community becomes an active area of research. But the smart community was not the main concept from the beginning. A local electricity distribution network or a home electricity system was a target system where ICT was applied to improve the energy efficiency. Soon, the scope of target system has been extended in the sense of energy variety and system dimension. Finally, the smart community concept appears to cover the wider subjects as described above.

A machine-to-machine (M2M) communication system is one of key players in ICT for the smart community. M2M communication system provides a mean to relay the data from a variety of sensors to a server under the effective and promised way. Based on the past wireless data communication technology research, we have studied M2M communication system involving a wireless link for the last several years. The wireless M2M communication system provides flexibility in the system design, especially when it is deployed into an existing environment. European R&D Project, 3e-Houses, will be an example of such study. 3e-Houses is a regional collaborative project with the main goal to involve customers in the energy system through ICT, allowing them to develop or enhance their relationship with the utility for saving energy. This will be achieved by piloting, in many social housing buildings, the interaction between smart devices and the users (being tenants, promoters and utilities) to create, initially, awareness around their energy consumption and therefore a change in their energy-use behaviour. For this purpose, a wireless M2M communication system for a home energy management was designed and operated in a stable state for more than one year to collect data from local residential homes. The system design and early result of the on-going project will be presented. That provides many insights to us on the requirement of wireless M2M communication system even for a future smart community.

Further, important technical subjects on future M2M communication system will be discussed by including results from our other research toward the total energy innovation.

In 1988, Mr. Baba has joined Toshiba R&D Center after receiving MEng. from Osaka University, Japan. In Toshiba R&D Center, he engaged in the research on optical communication systems, the Internet systems, wireless VOIP systems and so on. He was a visiting researcher at University of Pennsylvania, PA, USA from 1996 to 1997. After moving to the Telecommunications Research Laboratory, Toshiba Research Europe Ltd. in Bristol, UK in 2012, he engages in the research on the M2M communication system for future smart community and the future wireless communication system as Deputy Managing Director.

He received The Young Researchers' Award of IEICE in 1995. He is a Member of IEICE.

OPPORTUNISTIC SENSING AND ITS IMPLICATIONS

DR FAHIM KAWSAR,
BELL LABS, BELGIUM

The commercial availability of sensor-rich mobile hardware has greatly stimulated research about techniques that analyze, explain, and predict human mobility and activity patterns with consequences in a multitude of domains - accurate content dissemination, novel recommendation services, network optimization, resource planning for urban development, etc., to name a few. The current generation of smartphones is capable to continuously run data collection and aggregation software, providing researchers and businesses with a faithful and thorough description of a user's trajectory and mobility patterns. GPS coordinates, WiFi access points and cell association data, Bluetooth proximity information, accelerometer readings can all be collected and pieced together to gain an increasingly detailed picture of user habits, trajectories, and interactions. Although accurate, these efforts require much finer granularity of data and demand high energy consumption due to frequent update. An alternative and opportunistic approach is to leverage the power of network (mobile-residential-social) activity traces left behind by the individuals through their active usage of applications. To this end, in this talk I will discuss how residential and social network traces can be used to form rigorous understanding of an individual's activity dynamics. In particular, the talk will cover three novel techniques on modeling and predicting human activities with differential network analysis. Our approach call attention to the developers of future consumer-faced technology with implications to both end user service design and residential network optimization. With a better awareness of human activity dynamics, application developers can reach their intended customers with promotional offers and recommendation services in a timely fashion. Network operators can design personalised dynamic pricing package tailored to individual's need. Furthermore, elastic network resources can be better managed with an informed understanding of network usage, which eventually can minimize operational cost for the network operators.

Fahim Kawsar is the Director of the Scalable Systems Research Department at Bell Laboratories and working within the field of Distributed Systems, Data Analytics, and Pervasive ComputingHe has a PhD in Computer Science from Waseda University, Japan where he worked on the development of Human-Centered Software Architectures for Future Pervasive Systems and Internet of Things. From 2008-2010, he was at Lancaster University, UK focusing on Activity Modeling and Pervasive Displays and from 2004-2006 at Nokia Research Center, Tokyo working on Mobile and Embedded Systems. Fahim's work on Internet of Things, Distributed Middleware, Activity Modeling, Novel User Interfaces and Pervasive Displays have been published widely in international books and journals, presented at conferences across the world and has had projects commissioned. He's a former Microsoft Research Fellow and a member of the IEEE and the ACM. His work and publications can be viewed at http://www.fahim-kawsar.net.

ADAPTIVE POWERLINE COMMUNICATION SYSTEMS

DR HARIS GACANIN

ALCATEL-LUCENT BELL N.V., BELGIUM

In this talk we evaluate the potential of adaptive broadband power line communications (PLC) transmission over the classical in-house powerline wires. In PLC systems an orthogonal frequency division multiplexing (OFDM) has been adopted as physical access scheme to cope with the multipath channel reflections at the receiver end. However, for coherent detection in OFDM the accurate channel estimates are required. Currently, the channel estimation (CE) schemes based on time division multiplex (TDM) and frequency division multiplex (FDM) pilots are foreseen, where the channel delay-time domain windowing is used for noise reduction (de-noising) based on the pre-defined guard interval length. We evaluate the impact of house appliances on duration of channel delay spread as well as channel behavior in the frequency domain. We also present and evaluate a mechanism for efficient CE with adaptive de-noising algorithm designed based on mean square error criteria. The method is designed to reduce the noise in the system which is exploited by channel equalizer to improve the system's performance. The adaptive algorithm is used as a driver for the transceiver with adaptive guard interval based on the channel conditions. The algorithm performance is evaluated by computer simulation to illustrate efficiency of the adaptive PLC system.

Haris Gacanin was born in Sarajevo, Bosnia and Herzegovina, where he received his Dipl.-Ing. degree in Electrical engineering from the Faculty of Electrical Engineering, University of Sarajevo in 2000. He received his M.E.E. and Ph.D.E.E. from Graduate School of Electrical Engineering, Tohoku University, Japan, in 2005 and 2008, respectively. Since April 2008 until May 2010 he has been working first as Japan Society for Promotion of Science (JSPS) postdoctoral research fellow and then as an Assistant Professor at Graduate School of Engineering, Tohoku University. Currently, he is with Alcatel-Lucent Bell N.V. in Antwerp, Belgium and the Communication Group at Energy and Communication Department, IPSA Institute, Sarajevo, Bosnia and Herzegovina. His research interest is in the fields of wireline and wireless communications with focus on: home networking technology and architectures, management and diagnostics of home and access networks, xDSL transmission technology, wireless network coding, channel estimation and equalization, cognitive radio, MIMO, wireless sensor networks, dynamic resource allocation, iterative receivers, channel coding and hybrid ARQ, PAPR reduction, cooperative relaying, communication theory and gigabit PON identification. He has more than 50 publications in journals, conference proceedings and several patent applications. He is member of The Institute of Electrical and Electronics Engineers (IEEE) and the Institute of Electronics, Information and Communication Engineering (IEICE) and acting as a chair, review and technical program committee member of various technical journals and conferences. He is a recipient of the 2010 KDDI Foundation Research Grant Award, the 2008 Japan Society for Promotion of Science (JSPS) Postdoctoral Fellowships for Foreign Researchers, the 2005 Active Research Award in Radio Communications, 2005 Vehicular Technology Conference (VTC 2005-Fall) Student Paper Award from IEEE VTS Japan Chapter and the 2004 Institute of IEICE Society Young Researcher Award. He was awarded by Japanese Government (MEXT) Research Scholarship in 2002.

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INVITED SPEAKERS

A FEW APPLICATIONS OF SUPERCONDUCTING DIGITAL ELECTRONICS

ASSOC. PROFESSOR, PASCAL FEBVRE,
UNIVERSITY OF SAVOIE , FRANCE

Superconducting electronics has been used for a long time for niche applications in areas for which no other technology could meet the needs. This was needed to compensate the drawback of cryogenic cooling, often at liquid helium temperature at 4.2K, sometimes at less stringent temperatures like liquid nitrogen temperature at 77K since the discovery of high-Tc superconductivity in 1986. These specific areas include radio-astronomy and also optical astronomy, due to the requirements of receivers with ultimate sensitivity near the quantum limit. This is also the case in magnetometry where Superconducting Quantum Interference Devices (SQUIDs) are known to be the most sensitive magnetometers, used today in several fields including medicine, solid-state physics, particle physics, non-destructive evaluation or geological prospecting, as just a few examples.

Most of the devices developed were analog sensors or circuits. Nevertheless, during the last two decades, superconducting electronics has also been used to develop digital circuits by using Josephson junctions (the equivalent of the transistor in semiconductor electronics) in a specific mode for which the digital information is stored through quanta of magnetic flux and/or picosecond-duration voltage pulses. This type of digital electronics, called RSFQ for Rapid Single-Flux-Quantum [1], is a dynamic pulse logic which corresponds to a Return-to-Zero (RZ) mode of operation. RSFQ gates have the ability to operate potentially at very fast clock frequencies in the 10-1000 GHz range while consuming around one million times less than semiconductor gates. Some applications concern telecommunications and in particular Software-Defined Radio (SDR). Other ones are focused on the development of supercomputers or specific software processing tasks.

Dr. Pascal Febvre received his diploma of Physics and Chemistry from the 'Ecole Supérieure de Physique et Chimie Industrielles de la ville de Paris' (ESPCI) french 'Grandes Ecoles' in 1990. He received his Ph.D. diploma from the Université Pierre et Marie Curie - Paris VI in 1995. His Ph.D. work was performed at the laboratory of radioastronomy of the Observatory of Paris where he developed several superconducting receivers based on Superconductor-Insulator-Superconductor (SIS) mixers in the 380-750 GHz range for balloon-borne experiments.
In 1997, Dr. Febvre joined the LAHC laboratory, called now IMEP-LAHC (CNRS UMR5130) as a tenure-track associate-professor at University of Savoie where he built a research activity aimed at developing fast digital superconducting electronics based on the Rapid Si gle-Flux-Quantum (RSFQ) technique that processes magnetic flux quanta.

He teaches statistical physics, astrophysics and electromagnetism, and coached 6 PhD students and more than 50 undergraduate and graduate students. Dr. Febvre has an expertise in project management and superconducting electronics (sensors, digital, micro-nanotechnologies) in the microwave and THz frequency range, he owns more than 100 communications in International Journals and Conferences. He has been elected on the steering committee of the FLUXONICS European Society (2008-2010 and 2011-2013) and in the board of the European Society for Applied Superconductivity for the 2009-2013 period.

REMOTE MONITORING OF LIFE FUNCTIONS IN HOME ENVIRONMENT AND INFORMATION FUSION NET-WORK FOR ASSISTIVE MEDICAL DECISION MAKING

ASSOC. PROFESSOR IMRE CIKAJLO,
UNIVERSITY REHABILITATION INSTITUTE, SLOVENIA

Healthcare of elderly and people with neuromuscular disorders or diseases after discharge from the hospital has been one of the highest priorities in the last decade. The increasing number of aged population significantly increased the number of outpatient services, interventions and consequently affected the health care budget. Application of novel technologies, e.g. wireless technologies, smart sensors and efficient mathematical algorithms, may contribute to the less frequent outpatient services due to the possible remote monitoring of major life functions such as blood pressure, heart rate, weight, mobility, facial changes, movement patterns and others. Analysis of these major biomedical parameters has been possible with efficient mathematical algorithms and signal processing of measured signals. The measurement technology is nowadays already available on the market and sometimes even off the shelf devices can be applied as assessment tools. More sophisticated sensors can be integrated in the home equipment; oven, bed, floor, mirror, bedding, refrigerator, accessories or even clothes.

Hereby we present a contactless solution for basic health parameter surveillance like heart rate, breathing frequency and movement during resting or sleeping in the bed. Two optical wires were integrated into the bed sheets in a way that the technology was not hindering the person while lying on the bed. The optical fibers were extremely sensitive and could detect any mechanical vibration of the wires caused by sound, movement, etc. Thus the breathing frequency, heart rate (1) and the person's movement could be identified in the post-processed signal. The heat rate was detected from the changes of the interferometric signal, caused by mechanical deformation of the optical fibers placed in the bed mattress. Heartbeats induced the vibro-mechanical deformation and resulted in changes of the optical signal. The heart beat and the heart rate were extracted from the interferometric signal using signal zero-crossings and filter banks. A linear combination over Morlet wavelets at different scales was applied.

The heart rate was defined as sum of wavelets, defined by the criteria of center frequency between 0.8 Hz and 2.8 Hz, where the spacing between the central frequency and the neighboring wavelets was 0.015 Hz (2). Similar wavelets algorithm was applied for the breathing frequency, with different center frequencies between 0.2 Hz in 1 Hz, with 0.006 Hz spacing. Heart rate and breathing frequency detection was tested in 10 healthy volunteers without any dysfunction or disease, and 10 healthy volunteers with heart arrhythmia. Accuracy was more than 95% with negligible standard deviation. Sensitivity at breathing frequency detection was around 84% with standard deviation 11% and accuracy around 82% and with 3% standard deviation. After each assessment the data were transmitted to the database and from there selected data were available via secure user interface world-wide (Fig. 1). A sensor network information and fused information from the relevant database provide the medical experts enough data to decide on the necessity of the outpatient visit or intervention.

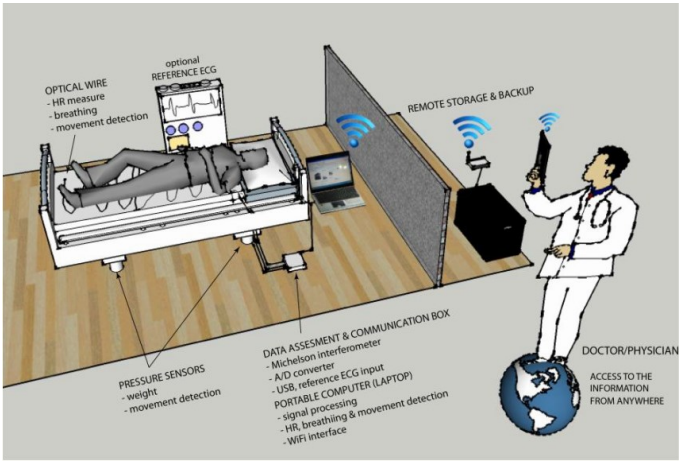

Figure 1. Contactless heart rate, breathing frequency and movement assessment on patient's home and remote monitoring of health parameters.

Imre Cikajlo received his PhD degree in robotics and electrical engineering from the University of Ljubljana, Slovenia in 2003. From 2003 until 2004 he was a post-doc fellow at the Tohoku University, Sendai, Japan and in 2007 a visiting researcher at the University of Tokyo, Japan. Currently he is a Senior Research Associate at the University rehabilitation institute, Ljubljana, Slovenia and an Associate Professor at the University of Nova Gorica, Slovenia. Prof.Cikajlo took part in several EU -FP7 projects (GENTLE/S, MIMICS, CORBYS) and is currently responsible for the Center of Competence Biomedical Engineering at the University rehabilitation Institute, Slovenia. He published 30 journal papers, altogether more than 100 papers, book chapters and books. In 2000 he received the Prešeren Award from Faculty of Electrical Engineering, University of Ljubljana. His research interests include human motion analysis and synthesis, biomechanics, integration of sensory information, control of machine and human movements and rehabilitation robotics. Currently he is involved in the development of rehabilitation devices and procedures that may be used in clinical and/or home environment through application of telerehabilitation techniques and introduction of virtual reality in rehabilitation. He is also a member of ISVR, IFMBE and IEEE.

NONLINEARITY COMPENSATION IN COHERENT OPTICAL COMMUNICATION SYSTEMS

ASSOC. PROFESSOR DARKO ZIBAR

DTU FOTONIK, DENMARK

In this talk compensation of nonlinear fiber optic impairments will be addressed. Different methods will be reviewed and explained.

Currently, the communication technology and thereby the ability to generate, process and store digital information constitutes a backbone of our modern society. Modern digital communication technology finds applications ranging from chip-to-chip communication found in/and between our computers, long haul transport networks carrying internet traffic, and space communication for collection of scientific data. Each of the applications can be addressed using wireline, wireless or optical fibre communication. So far, optical fibre has the advantage in terms of bandwidth and transmission distance over the other technologies, and optical fibre communication is therefore the preferred choice when transferring large amount of data like it is done in today's networks.

Even though the optical fibre has large bandwidth, the never ending introduction of new bandwidth hungry broadband services and content such as YouTube, Facebook, My Space, High Definition TV, etc., has resulted in a significant growth of the total data traffic, and this demand on bandwidth is strongly expected to continue [1-3]. This explosive growth of services pushes the demand for bandwidth by more than factor of 2 every 18 months [2]. Additionally, the upcoming applications where communication technology is involved such as tele-medicin, autonomous sensor networks, grid computing are expected to have a huge impact on the future demand on bandwidth [1].

Given the constraints of the optical fibre channel and taking into consideration the future Petabit capacity demands, an essential parameter to characterize an optical communication channel is its spectral efficiency, S [1-3]. The spectral efficiency expresses how many bits per second [bits/s] can be transmitted in a specific bandwidth [Hz]. The achievable spectral efficiency over a certain transmission distance D, the so-called SxD product, should exceed 100 b/s/Hz x 1000 km in order to reach the capacity demands projected in 10-15 years [1-3]. It has been shown that for long distance (>1000 km) communication systems, employing traditional technology, the spectral efficiency is currently limited to 5.6 b/s/Hz due to phase noise and optical fibre nonlinear impairments [4], see spectral efficiency vs. power chart in

In order to accommodate for the future bandwidth requirements, during the last four years, optical communication systems have experienced a paradigm shift by moving from a primitive and very inefficient way of encoding data (intensity modulation) to more sophisticated and spectrally efficient modulation techniques. However, in order to realize spectrally efficient optical communication systems there are still many scientific challenges to tackle. This is due to the fact that optical fibre channel is nonlinear and thereby limiting the achievable transmission distance. Therefore, the race on how to increase spectral efficiency □ transmission reach product is on. Additionally, phase noise associated with the lasers used for data modulation and demodulation is another limiting factor.

The application of digital signal processing (DSP) based coherent detection has allowed optical communication systems to operate closer to the nonlinear Shannon capacity limit by employing spectrally efficient modulation formats. Therefore, there is currently a lot of ongoing research on DSP based algorithms for signal detection and optical fibre channel impairment compensation. Linear signal processing algorithms can be effectively used to compensate for linear fibre channel impairments and have been demonstrated very successfully for higher order quadrature amplitude modulation (QAM) signaling. However, for long-haul systems employing higher order QAM, nonlinear optical fibre impairments can severely limit the transmission distance as well as the achievable total capacity [4]. Mitigation of optical fibre nonlinearities is therefore very crucial as it will allow launching more power into the fibre and thereby enhancing the transmission distance. Additionally, mitigation of fibre nonlinearities will help us reduce the nonlinear crosstalk from the neighboring channel in a multi-channel transmission system.

In this paper, we show numerically and experimentally that expectation maximization (EM) algorithm is a powerful tool in combating system impairments such as fibre nonlinearities, inphase and quadrature (I/Q) modulator imperfections and laser linewidth. The EM algorithm is an iterative algorithm that can be used to compensate for the impairments which have an imprint on a signal constellation, i.e. rotation and distortion of the constellation points. The EM is especially effective for combating non-linear phase noise (NLPN). It is because NLPN severely distorts the signal constellation and this can be tracked by the EM. The gain in the nonlinear system tolerance for the system under consideration is shown to be dependent on the transmission scenario. We show experimentally that for a dispersion managed polarization multiplexed 16-QAM system at 14 Gbaud a gain in the nonlinear system tolerance of up to 3 dB can be obtained. For, a dispersion unmanaged system this gain reduces to 0.5 dB.

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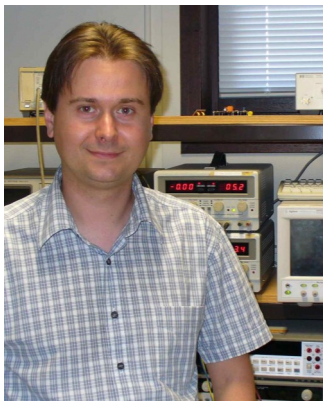
Darko Zibar was born in Belgrade, ex-Yugoslavia, on Sepetmber 9, 1978. He received the M.Sc. degree in telecommunication and Ph.D. degree in optical communications from the Technical University of Denmark, Lyngby, Denmark, in 2004 and 2007, respectively. He was a Visiting Researcher with Optoelectronic Research Group, University of California, Santa Barbara, January 2006 to August 2006, and in January 2008 where he was involved in coherent receivers for phase-modulated analog optical links. From February 2009 to July 2009, he was a Visiting Researcher with Nokia-Siemens Networks where he worked on 112 Gb/s polarization multiplexed systems. He is currently Associated Professor at DTU Fotonik, Technical University of Denmark. His research interests include coherent optical communication, with the emphasis on digital signal processing.

Dr. Zibar is the recipient of the Best Student Paper Award at the IEEE Microwave Photonics Conference 2006, the Villum Kann Rasmussen Postdoctoral Research Grant in 2007 and Villum Foundation Young Investigator Program in 2011.

INVITED

RECENT DEVELOPMENTS OF TRANSMITTER AND RECEIVER INTEGRATED CIRCUITS FOR OPTICAL FRONT-ENDS

PROFESSOR JOHAN BAUWELINCK,
GHENT UNIVERSITY, BELGIUM



Custom integrated circuit (IC) design enables the realization of new innovative transmitter and receiver sub-systems for low cost and energy efficient optical communication systems and optical interconnections. This talk will present our most recent developments for 10Gb/s passive optical access networks (PON), 100Gb/s metropolitan area networks and datacenter interconnections, funded by the European Commission through FP7 ICT framework, GreenTouch consortia and industrial collaborations.

Besides the ever increasing data rates, important drivers for this research are the need to drastically reduce the system power consumption and cost through miniaturization and close integration and co-optimization of the electronics, photonics and their interconnections. Strong collaboration with leading industrial partners on the system level, device level and photonic integration technology is the key for the success of this work. The examples highlighted in this talk are a 10Gb/s linear APD-based burst mode receiver, 10Gb/s bit-interleaving clock-and-data recovery chip, 10ax11Gb/s electro-absorption modulator (EAM) driver array, 2x28Gb/s EAM driver array for optical duobinary modulation and 4x28Gb/s receiver electronics. To finalize, three recently started FP7 projects will be briefly introduced as directions for future research.

Prof. Johan Bauwelinck was born in Sint-Niklaas, Belgium, in 1977. He received the Engineering degree in applied electronics and the Ph.D. degree in applied sciences, electronics from Ghent University, Ghent, Belgium, in 2000 and 2005, respectively. He became a part-time professor in the department of information technology (INTEC, associated lab of IMEC) at the same university in October 2009 and since February 2010 he has been a full-time tenure track professor there. His research focuses on high-speed, high-frequency (opto-) electronic circuits and systems, and their applications on chip and board level, including transmitter and receiver analog front-ends for optical access networks, burst-mode ONUs and OLTs for next generation PONs, low-power driver electronics for 10x11Gb/s and 4x28Gb/s applications and RF transceivers for wireless systems and instrumentation. He was and is active in the EU-funded projects GIANT, POWERNET, PIEMAN, Euro-FOS, C3-PO, DISCUS, Phoxtrot and MIRAGE. He co-authored more than 100 publications and 5 patents in the field of high-speed electronics and fiber optics and he is a member of the ECOC technical program committee.

RECENT DEVELOPMENTS OF TRANSMITTER AND RECEIVER INTEGRATED CIRCUITS FOR OPTICAL FRONT-ENDS

DR BAMIDELE ADEBISI,
MANCHESTER METROPOLITAN UNIVERSITY, UK

Power line Communications (PLC) technology is a front runner in providing communication solution for smart grid (SG) services. Distribution Line Carrier (DLC), also called high-speed narrow-band PLC system, is different from the broadband PLC because it operates within the 9 - 500 kHz range, although this is restricted to frequency range between 9 – 148.5 kHz in Europe. Achievable data rate goes up to 100s of kbps.

Distribution Line Carrier: Verification, Integration and Test of PLC Technologies and IP Communication for Utilities (DLC+VIT4IP) [1]- is a EU funded project under the FP7 which aims to extend the existing PLC technologies developing efficient transport of IPv6 protocol, automatic measurement, configuration and management, security, etc. by exploiting frequency ranges up to 500kHz to support SG applications that require higher bandwidth. By operating under 1MHz, it avoids electromagnetic interference (EMI) problems associated with broadband PLC (BPLC) [2]. In addition, it is able to achieve higher bit rate in comparison to the traditional narrowband PLC which operates in a much narrower frequency band. On the application side, the system is based on the Internet Protocol (IPv6). IP is an increasingly used protocol stack in many supervisory and control application fields, including the energy sector, and has been predicted to take a prominent role in future smart grid communication solutions . With IPv6, future smart grid applications, such as asset control/management, can be supported, with a flexible communication platform and improved interoperability.

Recent survey shows that of the 24 existing smart metering projects in Germany the majority (13) use PLC. The others use Digital Subscriber Line (DSL), General Packet Radio Service (GPRS) or other communication solution. The dominance of PLC in the smart metering projects can also be observed in other European countries, e.g., Spain, Italy, and the Netherlands [3,4]. Apparently, PLC technology is the favourite solution from the power utilities perspective. Since PLC infrastructure is owned by utilities, they have complete access and control. PLC is also an inexpensive means of providing new and intelligent applications to and from the last mile of the distribution grid, because it uses existing (cabling) infrastructure that covers a wider area than any other traditional communication network. DLC is therefore a promising communication platform for SG offering advantages in coverage, costs and availability.

In this talk, a general overview of the DLCVIT4IP smartgrid project will be given. 12 key application services for automating the Medium Voltage (MV) and Low Voltage (LV) Distribution Grid as shown in a survey made by the council on large electric systems, Conseil International des Grands Reseaux Électriques (CIGRE) in [5] will be presented. Those applications that will especially benefit from PLC and are targeted by DLC+VIT4IP will be discussed in detail. Table 1 presents a summary of traffic characteristics to the above application services and are key requirements for the DLC+VIT4IP solutions. Furthermore, lessons learnt from DLCVIT4IP in the areas of modem installation in MV and LV real life scenarios will be discussed and some measurement results including channel attenuation, input impedance, EMC, and BER performance will be presented. It will be shown that Important services based on the DLC+VIT4IP project has further strengthen PLC as a suitable technology for providing the much needed communication solution for the smart grid vision.

Figure 1: Modem Installations; Performance and EMC Measurements

Bamidele Adebisi received master's degree in advanced mobile communication engineering and PhD in communication systems from Lancaster University, United Kingdom, in 2003 and 2009, respectively. Before that, he obtained a bachelor's degree in electrical engineering from Ahmadu Bello University, Zaria, Nigeria, in 1999. He is currently a lecturer in electrical and electronics engineering in the School of Engineering, Manchester Metropolitan University. Between 2005 and 2012, he was a senior research associate in the School of Computing and Communication, Lancaster University. He has several publications and patent in the research area of data communications over power-line network and Smart Grid. His research interests include channel modelling, electromagnetic compatibility (EMC), coding and modulation for power line Communications (PLC); Visible Light Communication (VLC); electrical energy monitoring/management, critical infrastructures protection, and home automation; smart grid; M2M; and wire integrity testing. He is actively involved in various technical journals and conferences as co-chair, review and technical program committee member. Dr Adebisi is a member of IET and IEEE.

VIRTUAL RESTORATION AND ANALYSIS OF DIGITIZED PAINTINGS

PROFESSOR ALEKSANDRA PIZURICA,
GHENT UNIVERSITY, GHENT, BELGIUM

Digitization of art works has become a common practice. Museums are digitizing their collections mainly for the purpose of archiving and dissemination. This way the cultural heritage is protected and made accessible to a larger audience. Digitization opens also possibilities for virtual restoration of art works and mathematical analysis. For example, we can remove the signs of aging (such as cracks) from a digitized painting, visualize the effect of using different varnishes, discover patterns that would otherwise remain unnoticed or facilitate detection of forgeries.

With the rapid development of imaging sensors and various imaging modalities, the interest in scientific analysis of paintings is growing. It is now possible to zoom in the tiny details of the painting or the brushstrokes revealing structures that could have never been noticed by a naked eye. Moreover, imaging in different parts of the electromagnetic spectrum (from infrared to X-ray) as well as simultaneous imaging in a multitude of narrow spectral bands (hyperspectral imaging) can reveal other amazing aspects, such as under drawings and differentiation between the paint layers that would otherwise remain undiscovered. Digitization of paintings enables also a marvelous interaction between art and vision science. Vision scientists can learn from the works of art about features that are important for our visual perception of a scene. Using this knowledge, we can improve our computational models of the visual system and our digital image processing algorithms, which can in return improve digital restoration and computational analysis of images in general.

Fig. 1. Original (left) and digitally restored (right) fragments of the painting.

This talk addresses virtual restoration and painter style characterization in digitized paintings, using as a case study the famous polyptich "Adoration of the Mystic Lamb" painted by the Flemish masters, brothers Van Eyck in the 15th century. In the actual, physical restoration the cracks are never removed. Hence, only virtual restoration could present us the painting as it used to appear centuries ago, before marks of aging arose. This can not only greatly enhance the visual experience (which is important from the aesthetical and psychological points of view) but in some cases it can also facilitate deciphering the content (like text fragments), which can be of great importance for art historical and iconographical analysis (see Fig. 1).

Equally challenging is development of new tools for painter style authentication. We present some of the metrics for objective characterization of the painter style, especially focusing on painted pearls, which are so beautiful and abundant in the works of Van Eyck. We are challenged to extract a kind of painter's signature or an individual characteristic of the painter style by means of mathematical analyisis. In this context, the method that will be described here aspires to create a tool for art historical attribution. The potentials of this method to distinguish between the painter styles are discussed as well as some side applications, like bringing the painted object closer to a style of another painter.

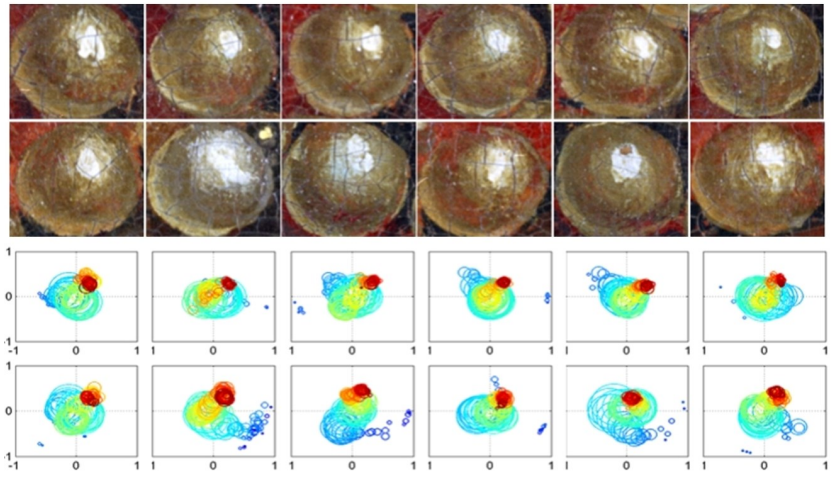


Fig. 2. A selection of painted pearls (top) and their digital signatures presented as spatiogram plots (bottom).

Aleksandra Pižurica is a professor in statistical image modelling at Ghent University. She received the Diploma Degree in Electrical Engineering from the University of Novi Sad, Serbia (1994), the M.Sc. degree in Telecommunications from the University of Belgrade, Serbia (1997) and the Ph.D. degree in Engineering from Ghent University, Belgium (2002). She was a postdoctoral fellow with the Fund for Scientific Research in Flanders – FWO (2005-2011). Since 2009, she is professor at Ghent University, where she has founded a Statistical Image and Vision Modelling team within the research group Image Processing and Interpretation. In 2009, she was also appointed as principal investigator within Belgian inter-University research department Future Media and Imaging (FMI) at the Institute of Broadband Technology (IBBT), where she is leading the research unit Video and Image Content Analysis (VICA).

Aleksandra Pižurica has authored and co-authored more than 200 publications in international journals, conferences and book chapters. She has published mostly on multiresolution statistical image modelling with applications to image and video restoration, especially in the area of wavelet domain noise reduction. Her current research interests include efficient representations of multidimensional signals and hierarchical statistical models of visual perception.

INVITED

MODELLING OF MULTI-SERVICE NETWORKS WITH OVERFLOW TRAFFIC

PROFESSOR MARIUSZ GŁĄBOWSKI ,
POZNAN UNIVERSITY OF TECHNOLOGY, POLAND

The development of network control techniques based on traffic overflow has provided one of the basic methods that can be used in optimization of the usage of network resources with simultaneous provision of all the required quality parameters for individual traffic streams offered to the network. In the networks with overflow traffic two types of resources are used, i.e. direct resources and alternative resources. Calls that cannot be serviced by the direct resources are redirected to alternative resources. Alternative resources for given connections can comprise direct resources for other connections. The use of the alternative resources decreases the overall cost of the network and enables operators to extend its transmission capabilities without a simultaneous increase in the capacities of nodes and with the assumed traffic loss factor retained.

Initially, traffic overflow was used exclusively in traditional hierarchical telecommunications networks. Gradually, with the increase in popularity of radio networks, in which optimization of limited resources becomes a significant challenge, traffic overflow has been introduced to wireless networks of the second, third and fourth generation. The major difficulty that occurs during an analysis of systems with traffic overflow is to determine the demanded volume of alternative resources (with low losses). If we assume that a given distribution of time between calls offered to the primary resources (e.g. exponential distribution), then traffic that overflows from these resources will be of a different nature, because calls from an overflow stream can appear only during the total occupancy of the primary resources. If we assume identical value of the offered traffic and identical value of the blocking probability, then to execute service for the overflow traffic, a greater number of resources is required than that for the service of the traffic offered to the primary resources.

In this talk, the methods for analytical modelling of multi-service networks with implemented traffic overflow mechanisms will be elaborated and some numerical results will be shown

Prof. Mariusz Głąbowski received the M. Sc., Ph. D. and D. Sc. (Habilitation) degrees in telecommunication from the Poznan University of Technology, Poland, in 1997, 2001, and 2010, respectively. Since 1997 he has been working in the Department of Electronics and Telecommunications, Poznan University of Technology. He is engaged in research and teaching in the area of performance analysis and modelling of multiservice networks and switching systems.

Mariusz Głąbowski is the author/co-author of 4 books, 9 book chapters and of over 100 papers which have been published in communication journals and presented at national and international conferences. He has attended 40 conferences and workshops, and presenting 42 papers at these. His teaching in the Department of Electronics and Telecommunications, Poznan University of Technology, largely focuses on the M.Sc. and Ph.D. in Telecommunication where he gives lectures and conducts laboratory courses on Communication Network Design, Network Algorithms, Teletraffic Engineering, Programming in C++, and Algorithms and Data Structures. Mariusz Głąbowski also participates in industrial education acting as a lecturer in courses on communication network design, network simulation, routing and switching.

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INVITED

PAPR REDUCTION AND RELATED TECHNIQUES FOR POWER EFFICIENT MULTI-CARRIER/MULTI-CODE WIRELESS COMMUNICATION SYSTEMS

DR OSAMU MUTA, KYUSHU UNIVERSITY, JAPAN

Demands for higher data rate in wireless communication systems have been increasing recently. In general, as transmission rate increases, cell coverage area decreases, and hence it is required to deploy many base nodes as access point (AP) in order to cover the service area, and consequently increase implementation cost of wire-line systems that are connected to each AP. One of solutions to this, a radio relay system such as wireless backhaul is promising, where several APs are connected to a radio relay station (RS) by radio channels and a few of them are connected to the outside network by cable. In this system, at each base station such as APs and RSs, it is desirable to use a power amplifier with high power efficiency and low nonlinear distortion. When the signal is amplified at a power amplifier with nonlinear characteristics, out-of-band radiation is generated attributable to nonlinear distortion. Although nonlinear distortion is reduced by decreasing the signal level to operate the amplifier within linear region, i.e., taking a large amount of back-off from saturation point of power amplifier, it causes power efficiency degradation. Therefore, it is necessary to compensate for nonlinearity of input-output characteristic in power amplifiers in order to satisfy two conflicting requirements, i.e., high power efficiency and low nonlinear distortion.

In multi-carrier/multi-code transmission systems, the transmit signal exhibits high peak-to-average power ratio (PAPR) which causes power efficiency degradation at the power amplifier. As a solution to the PAPR problem, several PAPR reduction techniques have been proposed. To achieve high power efficiency at power amplifiers, combination of adaptive linearization for input-output characteristics at power amplifier and PAPR reduction of the transmit signal is a promising and necessary approach. In addition, when special division multiple access in multi-antenna systems is considered, it is desirable to optimize the transmit weights under the constraints of total transmit power and per-antenna transmission power so that the transmit power for each antenna is limited below a given threshold; a low output (i.e., low cost) power amplifier is used for every antenna elements.

In this presentation, a topic related to PAPR reduction and related techniques for multi-carrier/multi-code wireless communication systems are mainly presented: PAPR reduction techniques for multi-carrier/multi-code transmission systems, an adaptive linearization technique using orthogonal functions for nonlinear power amplifier, and a transmitter weight optimization technique under per-antenna power constraint for spatial division multiple access systems.

Finally, our current research activities in Center for Japan-Egypt Cooperation in Science and Technology (EJUST Center) at Kyushu University are briefly introduced, where we have carried out collaboration research with E-JUST University (Egypt-Japan University of Science and Technology), a national university in Egypt, mainly on the field of wireless communications.

Osamu Muta received a B.E. degree from Ehime University, Ehime, Japan, in 1996, an M.E. degree from Kyushu Institute of Technology, Fukuoka, Japan, in 1998, and a Ph.D. degree from Kyushu University, Fukuoka, Japan in 2001. In 2001, he joined the Graduate School of Information Science and Electrical Engineering, Kyushu University as an assistant professor. Since 2010, he has been an associate professor in Center for Japan-Egypt Cooperation in Science and Technology, Kyushu University. His current research interests include signal transmission processing techniques for high-speed wireless communications and power-line communications, and nonlinear distortion compensation techniques for high-power amplifiers. He received the 2005 Active Research Award for excellent presentation from IEICE Radio Communication Systems.

COOPERATIVE COMMUNICATIONS WITH CONFIDENTIAL MESSAGES

DR NINOSLAV MARINA,
SWISS FEDERAL INSTITUTE OF TECHNOLOGY IN LAUSANNE, SWITZERLAND

In this talk I will present my Marie Curie project called "Cooperative communications with confidential messages". Information-theoretic secrecy, is a promising theoretical framework for the future multiterminal communication systems since it uses the ability of the physical layer to provide security of the transmitted data.

I will describe few examples on how cooperation can increase the secrecy capacity in a decentralized wireless network. Our investigations show some improvement possibilities, if instead of acting individually, nodes are "encouraged" to cooperate.

Ninoslav Marina received his Dipl. El.-Ing. degree from the "Sv. Kiril i Metodij" University, Skopje, Macedonia, in 1998, and his Ph.D. degree from the Swiss Federal Institute of Technology in Lausanne (EPFL), in January 2004. Part of his thesis was completed at Nokia Research Centre in Helsinki. After the graduation, he worked as a researcher at the Signal Processing Institute at EPFL, and later as a Head of Research and Development at Sowoon Technologies. In 2007 he won the Swiss National Science Foundation Fellowship and was a Visiting Scholar at University of Hawaii at Manoa. During the period 2008 - 2009, he was a Postdoctoral Fellow at University of Oslo. From 2009 till 2012 he was a Visiting Postdoctoral Research Associate at Princeton and currently he is a Visiting Research Collaborator at the same university. In August 2012 he has been appointed as a Rector of the University of Science and Technology "St. Paul the Apostle" in Ohrid.

INVITED

PHOTONIC TECHNOLOGIES FOR OPTICAL FIBER-WIRELESS SEAMLESS DATA CONNECTIVITY

PROFESSOR IDELFONSO TAFUR MONROY
DTU FOTONIK, DENMARK

In this talk we will review recent results in the area of photonic technologies applied to realizing ultra-high capacity wireless links that are seamlessly integrated with optical fiber data links for short range end-user connectivity.

Idelfonso Tafur Monroy is currently Professor and head of the metro-access and short range communications group of the Department of Photonics Engineering at the Technical University of Denmark. He graduated from the Bonch-Bruevitch Institute of Communications, St. Petersburg, Russia, in 1992, where he received a M.Sc. degree in multichannel telecommunications. In 1996 he received a Technology Licenciate degree in telecommunications theory from the Royal Institute of Technology, Stockholm, Sweden. The same year he joined the Electrical Engineering Department of the Eindhoven University of Technology, The Netherlands, where he earned a Ph.D. degree in 1999 and worked as an assistant professor until 2006.
He has participated in several European research framework projects in photonic technologies and their applications to communication systems and networks. At the moment he is involved in the ICT European projects GiGaWaM and EURO-FOS and is the technical coordinator of the ICT-CHRON project. His research interests are in hybrid optical-wireless communication systems, high-capacity optical fiber communications, digital signal processing for optical transceivers for baseband and radio-over-fiber links, application of nanophotonic technologies in the metropolitan and access segments of optical networks as well as in short range optical-wireless communication links.

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