IEEE BROADCAST TECHNOLOGY SOCIETY YOUNG PROFESSIONALS WORKSHOP 2018

THE CONVERGENCE OF BROADCASTING AND 5G ENABLING TECHNOLOGIES

PROGRAM AND ABSTRACT

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Welcome

On behalf of the organizers, we would like to welcome you to "IEEE Broadcast Technology Society Young Professionals Workshop 2018" on the theme "The Convergence of Broadcasting and 5G Enabling Technologies". IEEE BTS Young Professionals (YP) program (formerly GOLD) was created to help students transition to young professionals within the Broadcast Technology Society IEEE community.

The Workshop, lasting two days, focuses on a program of lectures, given by international experts in the area of broadcasting and 5G networks. All the invited keynote speakers are of renowned international reputation. They belong to nine different European universities and most of them are collaborating with the researchers of DIIES Department. Students will have the opportunity to participate in a stimulating forum of scientists, to present their own work, to obtain feedbacks and to start up collaborations. Lectures will provide background on 5G wireless communication concepts and particular emphasis will be placed on broadcast and multicast convergence in 5G network. The Workshop is tailored towards Researchers, PhD, Masters, and Bachelor Students active or interested in future broadcasting networks.

The Workshop will take place in Reggio Calabria, located on the "toe" of the Italian Peninsula and separated from the island of Sicily by the Strait of Messina. It is situated on the slopes of the Aspromonte, a long, craggy mountain range that runs up through the centre of the region. The third economic centre of mainland Southern Italy, the city proper has a population of more than 200,000 inhabitants spread over 236 square kilometres (91 sq mi), while the fast-growing urban area numbers 260,000 inhabitants. About 560,000 people live in the metropolitan area, recognised in 2015 by Italian Republic as a metropolitan city.

We would like to take this opportunity to express our sincere appreciation to all those who have contributed to the IEEE BTS Young Professionals 2018: the speakers as well as the members of the program committee. See you at the next IEEE BTS Young Professionals Workshop!

Prof. Giuseppe Araniti (University Mediterranea of Reggio Calabria)
Vice-Chair of IEEE BTS – Italy Chapter,
Prof. Wout Joseph (Ghent University, Ghent, Belgium)
Young Professionals Committee Chair

Committee

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Program Overview

Monday, 16th April 2018

09.00 – 09.30: Registration

09.30 – 10.00: Opening

Prof. Pasquale Catanoso – Rector of University 'Mediterranea' of Reggio Calabria

Prof. Giuseppe Araniti – DIIES Dep. University 'Mediterranea' of Reggio Calabria

Prof. Wout Joseph – Young Professionals Committee Chair

Prof. Carlo Morabito – Vice Rector of Internationalization Activities

Prof. Giacomo Messina – Director of DIIES Dep. University 'Mediterranea' of Reggio Calabria

Prof. Antonio Iera – Head of ARTS Laboratory – DIIES Dep.

Eng. Antonia Russo – E.U.Re.Ca. Students Association

10.00 – 10.45: Prof. Frank H. P. Fitzek, "Tactile Internet with Humans in the Loop"

10.45 – 11.15: Coffee Break

11.15 – 12.00: Prof. David Gomez-Barquero, "Broadcast and Multicast Communications Enablers for 5G"

12.00 – 12.45: Prof. Giuseppe Araniti, "Broadcast/Multicast Communications in the 5G Era: From the Human towards the Machine Traffic Perspective"

12.45 – 14.30: Lunch

14.30 – 15.15: Prof. Ulrich H. Reimers, "Convergence between Broadcast and Mobile Broadband"

15.15 – 16.00: Prof. Gabriel-Miro Muntean, "Multimedia Delivery In Future Network Environments: Challenges and Approaches"

16.00 – 16.30: Coffee Break

16.30 – 17.15: Dr. Tim Raats, "Netflix, or the end of broadcasting as we know it?! Financing and production of television content in the European market"

17.15 – 18.00: Prof. Antonio Iera, "New Communications Paradigms for Future Networks Leveraging the Social Internet of Things"

20.30 – 24.00: Gala Dinner

Tuesday, 17th April 2018

09.00 – 09.30: Registration

09.30 – 10.00: Prof. Antonella Molinaro, "5G V2X: Coping with the Challenge of Cooperative Automated Driving"

10.00 – 10.45: Prof. Pablo Angueira, "Present and Future Uses of Spectrum for Wireless Multimedia"

10.45 – 11.15: Coffee Break

11.15 – 12.00: Prof. Maurizio Murroni, "Quality of Experience for Advanced Broadcast Services"

12.00 – 12.45: Prof. John Cosmas, "Internet of Radio-Light Architecture for the Tactile Internet"

12.45 – 13.15: Discussion & Close

Topics and Speakers

WOUT JOSEPH
Ghent University, Ghent, Belgium

Biography

Wout Joseph was born in Ostend, Belgium on October 21, 1977. He received the M. Sc. degree in Electrical Engineering from Ghent University (Belgium), in July 2000. From September 2000 to March 2005 he was a research assistant at the Department of Information Technology (INTEC) of the same university. During this period, his scientific work was focused on electromagnetic exposure assessment. His research work dealt with measuring and modelling of electromagnetic fields around base stations for mobile communications related to the health effects of the exposure to electromagnetic radiation. This work led to a Ph. D. degree in March 2005. Since April 2005, he is a postdoctoral researcher for iMinds-UGent/ INTEC. From October 2007 to October 2013, he was a Post-Doctoral Fellow of the FWO-V (Research Foundation – Flanders). Since October 2009, he is a professor in the domain of Experimental Characterization of wireless communication systems. His professional interests are electromagnetic field exposure assessment, in-body electromagnetic field modelling, electromagnetic medical applications, propagation for wireless communication systems, antennas and calibration. Furthermore, he specializes in wireless performance analysis and Quality of Experience.

FRANK H. P. FITZEK

Tactile Internet with Humans in the Loop

Deutsche Telekom Chair of Communication Networks, Dresden, Germany

Abstract

5G is the first global communication system targeting low latencies. This will enable the Tactile Internet with several interesting use cases such as Telemedicine, Co-habitation of humans and robots, or more general the Internet of Skills. The open research question is the trade-off between latency, throughput, and resilience under further constraints such as security, energy, and heterogeneity. Novel concepts such as compressed sensing or network coding are the enablers to soften this trade-off. The talk will also highlight the basic 5G concepts for the Tactile Internet such as network slicing, mobile edge clouds, and multi-connectivity.

Biography

Frank H. P. Fitzek is a Professor and head of the "Deutsche Telekom Chair of Communication Networks" at TU Dresden coordinating the 5G Lab Germany. He received his diploma (Dipl.-Ing.) degree in electrical engineering from the University of Technology – Rheinisch-Westfälische Technische Hochschule (RWTH) – Aachen, Germany, in 1997 and his Ph.D. (Dr.-Ing.) in Electrical Engineering from the Technical University Berlin, Germany in 2002 and became Adjunct Professor at the University of Ferrara, Italy in the same year. In 2003 he joined Aalborg University as Associate Professor and later became Professor. He co-founded several start-up companies starting with acticom GmbH in Berlin in 1999. He has visited various research institutes including Massachusetts Institute of Technology (MIT), VTT, and Arizona State University. In 2005 he won the YRP award for the work on MIMO MDC and received the Young Elite Researcher Award of Denmark. He was selected to receive the NOKIA Champion Award several times in a row from 2007 to 2011. In 2008 he was awarded the Nokia Achievement Award for his work on cooperative networks. In 2011 he received the SAPERE AUDE research grant from the Danish government and in 2012 he received the Vodafone Innovation prize. In 2015 he was awarded the honorary degree "Doctor Honoris Causa" from Budapest University of Technology and Economy (BUTE). His current research interests are in the areas of wireless and mobile 5G communication networks, mobile phone programming, network coding, cross layer as well as energy efficient protocol design and cooperative networking.

DAVID GOMEZ-BARQUERO
Broadcast and Multicast Communications Enablers for 5G
Universitat Politecnica de Valencia (UPV), Valencia, Spain

Abstract

This lecture discusses the opportunity to incorporate multicast/broadcast point-to-multipoint (PTM) communication capabilities in 5G as built-in delivery features from the outset, integrating unicast point-to-point (PTP) and multicast/broadcast PTM modes under one common framework and enabling a dynamic use of PTM transmissions to maximize network and spectrum efficiency. In combination with advanced caching technologies, this approach will open a door to completely new levels of network management and delivery cost-efficiency. This lecture will introduce the ITU (International Telecommunications Union) IMT-2020 (International Mobile Telecommunication) standardization process, review use cases for PTM transmissions in 5G, and present the main technical challenges to design PTM communication enablers in the 5G radio access and core networks and to provide 5G broadcast services using dynamic network slicing.

Biography

David Gomez-Barquero received the double M.Sc. degrees in telecommunications engineering from the Universitat Politecnica de Valencia (UPV), Spain, and the University of Gavle, Sweden, in 2004, and the Ph.D. degree in telecommunications from the UPV in 2009. He is a Senior Researcher (Ramon Cajal Fellow) with the Institute of Telecommunications and Multimedia Applications, UPV, where he leads a research group working on next generation cellular and television broadcasting technologies. He hold visiting research appointments at Ericsson Eurolab, Germany, the Royal Institute of Technology, Sweden, the University of Turku, Finland, the Technical University of Braunschweig, Germany, the Fraunhofer Heinrich Hertz Institute, Germany, the Sergio Arboleda University of Bogota, Colombia, and the New Jersey Institute of Technology, Newark, NJ, USA. Since 2008, he has been actively participating in the European Digital Television Standardization Forum DVB in different topics such as upper layer forward error correction, DVB-T2, T2-Lite, and DVB-NGH. In 2013, he joined the U.S. Digital Television Standardization Forum ATSC to work on ATSC 3.0, where he is the Vice-Chairman of the Modulation and Coding Ad-Hoc Group. He is the Editor of the book entitled Next Generation Mobile Broadcasting (CRC Press) and an Associate Editor of the IEEE transactions on broadcasting.

GIUSEPPE ARANITI

**Broadcast/Multicast Communications in the 5G Era:
From the Human towards the Machine Traffic Perspective**

University Mediterranea of Reggio Calabria, Reggio Calabria, Italy

Abstract

Group-oriented services (broadcast, multicast, etc.) represent an effective solution to simultaneously convey data to a group of terminals through point-to-multipoint (PtM) communications. These services are able to improve capacity and spectrum efficiency in cellular systems which are crucial for the development of 5G networks, as highlighted, for instance, in recent METIS and 5GNOW European research projects. In the vision of future 5G systems where a massive growth of connected devices is expected, group-oriented services are expected to play a fundamental role. In this context, video transmission is considered as the "killer" human- and group-oriented application. However, high quality video transmission is a bandwidth-hungry application with stringent requirements in terms of jitter and data rate. A further key development trend towards the 5G era is the wide diffusion of low-power devices and a fast network densification to support the deployment of the Internet of Things (IoT). In this field, machine-type communications (MTC) push towards the design of effective solutions to deliver small amount of data simultaneously to a very large (and unpredictable) number of MTC/IoT devices. Group-oriented communications in the MTC/IoT environment require low latency and low overhead procedures in order to save battery resources. Based on these considerations, the ecosystem of 5G group-oriented services is expected to be really heterogeneous and requiring network flexibility according to the different service requirements. Research and industrial organizations are, therefore, being very active in the definition of well performing solutions to best handle this kind of traffic in cellular environments where the limited radio resources and the dissimilar channel quality experienced by users/devices are challenging aspects

Biography

Giuseppe Araniti is an Assistant Professor of Telecommunications at the University Mediterranea of Reggio Calabria, Italy, and a member of the Laboratory for Advanced Researches into Telecommunication Systems (ARTS). From September 1999 to July 2000 he worked in the field of Satellite Personal Communications for the COMNETS Department – Aachen University of Technology, Rhein.- Westf. Techn. Hochschule (RWTH), Germany. He received a (laurea) degree in Electronic Engineering from the University of Reggio Calabria, Italy, in 2000 and then he received a grant from Regione Calabria – Italian Ministery of Education for his research in the field of mobile radio telecommunications. He received the PhD in Electronic Engineering from the same University, in March 2004. Currently, he lectures "Wireless Systems Planning" and "Radio Mobile Networks" at the DIIES Department. His major areas of expertise is 5G networks, Personal Communications Systems, Enhanced Wireless and Satellite Systems, Traffic and Radio Resource Management, Multicast and Broadcast Services, device-to-device and machine type communications over 4G/5G cellular networks. At present, he is cooperating with several national and international research groups in the field of cellular wireless systems. He is author of about 130 papers, published in international journals/magazine and proceedings of international conferences. He is associate editor of IEEE Access Journal, IEEE Senior Member and vice-chair of IEEE BTS – Italy Chapter.

ULRICH H. REIMERS

Convergence between Broadcast and Mobile Broadband

Technische Universitaet Braunschweig, Braunschweig, Germany

Abstract

The mobile industry is increasingly looking at evolved Multimedia Broadcast Multicast Service (eMBMS), an LTE embedded broadcast approach to serve a growing mobile video/ TV consumption and other highly popular data services. But, eMBMS has so far only been used in small scale scenarios with local coverage. When it comes to large scale service areas with regional or even national coverage, the cellular nature of eMBMS will not be sufficient for cost efficient LTE broadcast content distribution. Adapting LTE broadcast to traditional High Tower High Power (HTHP) broadcasting towers and introducing this as a third service layer, i.e. as an extension of LTE unicast and eMBMS resolves this issue as it reduces network load, energy consumption and network costs for such popular services. Additionally, it creates the possibility of cooperation between the cellular and broadcasting networks enabling a cooperative spectrum usage. The term "Tower Overlay over LTE-Advanced+ (TOoL+)" describes the transmission of an extension of LTE-Advanced (LTE-A) offering broadcast services, especially live video, from a traditional High Tower High Power (HTHP) broadcast infrastructure, rather than in a cellular LTE-A network. Based on the significant experience gained with TOoL+, IfN has also started to investigate a "Tower Overlay over 5G" by first working on the implementation of the 5G New Radio specification (as it evolves) in its SDR environment. Goal of the activity is to then verify its real limitations and to overcome them by potentially offering a new 5G network layer based on large cells.

Biography

Ulrich H. Reimers studied communication engineering at Technische Universitaet Braunschweig, Germany. Following research at the university's Institut fuer Nachrichtentechnik (IfN – Institute for Communications Technology) he joined BTS Broadcast Television Systems in Darmstadt. Between 1989 and 1993 he was Technical Director of Norddeutscher Rundfunk (NDR) in Hamburg – one of the major public broadcasters in Germany. Since 1993 he has been a Professor at Technische Universitaet Braunschweig and Managing Director of the Institut fuer Nachrichtentechnik (Institute for Communications Technology). Prof. Reimers was chairman of the Technical Module within the DVB Project from 1993 to 2012 and a board member of Deutsche TV-Plattform (the German institution co-ordinating the interests of all organisations involved in TV) from 1992 to 2012. Since 2012 he is Vice President Strategic Development and Technology Transfer of Technische Universitaet Braunschweig. He is the author of more than 120 publications, among others of various text books on DVB. Prof. Reimers received a significant number of international and national awards. Recently Prof. Reimers and the research teams at IfN invented innovative solutions for the co-existence of broadcast and wireless broadband such as "Dynamic Broadcast", "Tower Overlay over LTE-A+ (TOoL+)", or "Redundancy on Demand". Recently IfN has started to investigate a "Tower Overlay over 5G (Too5G)".

GABRIEL-MIRO MUNTEAN

**Multimedia Delivery in Future Network Environments:
Challenges and Approaches**

Dublin City University, Dublin, Ireland
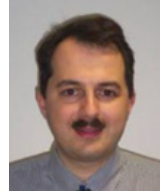
Abstract

The expectations are that more than three quarters of world data traffic will be video-related. This content will include professional and user generated clips, video from streamed and downloaded services, pre-recorded media or generated on the fly and will involve different degrees of interactivity. The content will be consumed at home, at work, in public places by a heterogeneous user population while static or on the move. A wide range of devices will contribute to generation and use of this content which will be distributed over a network environment which is highly heterogeneous. Several solutions which address the challenges of supporting quality, performance and/or energy efficiency in such a complex situation are discussed.

Biography

Gabriel-Miro Muntean is a Senior Lecturer with the School of Electronic Engineering, Dublin City University (DCU), Ireland, where he obtained his Ph.D. degree in 2003 for research on quality oriented adaptive multimedia streaming over wired networks. Dr. Muntean is co-Director of the DCU Performance Engineering Laboratory and Consultant Professor with the Beijing University of Posts and Telecommunications, China. His research interests include quality-oriented and performance-related issues of adaptive multimedia delivery, performance of wired and wireless communications, energy-aware networking and performance of large scale networking systems. Dr. Muntean has published over 250 papers in prestigious international journals and conferences, has authored three books and sixteen book chapters and has edited seven other books and conference proceedings. Dr. Muntean is Associate Editor of the IEEE Transactions on Broadcasting, Editor for the IEEE Communication Surveys and Tutorials and reviewer for other important international journals, conferences and funding agencies. He is a member of IEEE and IEEE Broadcast Technology Society. He is the Coordinator of the EU project NEWTON http://newtonproject.eu.

TIM RAATS

Netflix, or the End of Broadcasting as We Know It?! Financing and Production of Television Content in the European Market

Vrije Universiteit Brussel, Brussel, Belgium

Abstract

In Europe, broadcasters have traditionally been the main suppliers and investors of domestic television content, and played an essential role in sustaining highly popular yet cost-intensive genres as high-end drama and documentary. Over the past years however, new platforms and new market entrants – most notably over-the-top players such as Netflix, Amazon and Hulu – have challenged existing business models of European broadcasters. On the one hand, these platforms generate market scale and thus potential new revenue for producers. On the other hand, the proliferation of platforms also increases fragmentation of distribution windows, and hence, an increasing fragmentation of financing. This put particular pressure on challenging smaller television markets, which are already highly dependent on government support for sustaining domestic television content. Governments have increasingly picked up on the concerns of producers and broadcasters. On a European level, investment obligations and quota systems for Netflix are proposed as part of the Audiovisual Media Services Directive. This presentation starts with an overview of the current status of the European television market. We furthermore shed light on how new market entrants have an impact on investments and production strategies, and how that in turn, affects the sustainability of broadcasters in Europe. The presentation focuses particularly on investment in TV drama, since they are in high demand to include in over-the-top offerings. Examples of specific television series (The Crown, The Bridge, Borgen) will be used to reveal how players like Netflix are re-shaping the European television market. Evidence derives from ongoing scholarly work in the fields of media economics and media policy, and recent data from studies on sustainability of small media ecosystems the presenter was involved in.

Biography

Tim Raats lectures political economy of creative industries and media policy courses at the communication sciences department at the Vrije Universiteit Brussel. He holds a PhD in media and communication studies at the same university. Tim is senior researcher at imec-SMIT-VUB (Studies on Media, Innovation and Technology), where he specializes in public service media policy, with a particular focus on partnership strategies, and television production in small media markets. Tim coordinated several research projects for the Flemish Minister of Media, the Department of Culture, Youth, Sports and Media in Flanders, the Flemish Sector Council for Media and the public broadcaster VRT. Tim published widely in edited volumes and peer-reviewed journals.

ANTONIO IERA

**New Communications Paradigms for Future Networks
Leveraging the Social Internet of Things**

University Mediterranea of Reggio Calabria, Reggio Calabria, Italy

Abstract

This lecture addresses a major drawback in current IP networks which could hinder the deployment of future IoT unicast and multicast services in IP-based networks for future 5G systems: the impossibility of splitting the unique host identifier (ID) from its network layer locator(s) likely changing over time. It will be discussed how the introduction of social notions can definitely support networking functions and improve the ID-to-locator splitting procedures in the context of future frameworks for the Internet of Things (IoT). Furthermore, hints on possible research directions aimed at leveraging the described new networking functionalities to design a novel network primitive, suitably thought for handling multicast traffic on social basis, are given.

Biography

Antonio Iera graduated in Computer Engineering at the University of Calabria, Italy, in 1991 and received a Master Diploma in Information Technology from CEFRIEL/Politecnico di Milano, Italy, in 1992 and a Ph.D. degree from the University of Calabria in 1996. Since 1997 he has been with the University of Reggio Calabria and currently holds the position of full professor of Telecommunications and Director of the Laboratory for Advanced Research into Telecommunication Systems (www.arts.unirc.it). IEEE Senior Member since 2007. His research interests include, next generation mobile and wireless systems, RFID systems, and Internet of Things.

ANTONELLA MOLINARO
5G V2X: Coping with the Challenge of Cooperative Automated Driving
University Mediterranea of Reggio Calabria, Reggio Calabria, Italy

Abstract

The automotive vertical market is undoubtedly a main driver of 5G systems, with Vehicle-to-Everything (V2X) communication intended as the key for fully connected and autonomous transport This lecture provides a brief overview of the main progress in V2X-related R&D, with a focus on 3GPP Cellular V2X communications, its unique application demands and still unsolved issues. The discussion highlights the key challenges and intriguing opportunities opened by 5G and beyond cutting-edge technologies and enablers towards the achievement of cooperative automated driving.

Biography

Antonella Molinaro is an associate professor of Telecommunications at the University Mediterranea of Reggio Calabria, Italy. Before, she was with the University of Messina (1998-2001) and the University of Calabria (2001-2004) as an assistant professor; with the Polytechnic of Milano as a research fellow (1997-1998); and with Siemens A.G., Munich, Germany as a CEC fellow in the RACE-II program (1994-1995). She graduated in Computer Engineering (1991) at the University of Calabria, received a Master diploma in Information Technology from CEFRIEL/Polytechnic of Milano (1992), and a Ph.D. degree in Multimedia Technologies and Communications Systems (1996). Her current research activity mainly focuses on wireless and mobile networking, vehicular networks, information-centric networking, Internet of Things. She received five best paper awards and one best paper award nomination. She participates in the Information Centric Networking Research Group (ICNRG) of IRTF and the NetWorld2020 European Technology Platform. She is a member of the Editorial board of Computer Networks, Transactions on Emerging Telecommunications Technologies, International J. of Distributed Sensor Networks, and EAI Transactions on Internet of Things. She is co-editor of the book "Vehicular ad hoc Networks – Standards, Solutions, and Research", published by Springer International in 2015.

PABLO ANGUEIRA

Present and Future Uses of Spectrum for Wireless Multimedia

University of the Basque Country, Bilbao, Spain

Abstract

The use of spectrum and its management have been a hot discussion topic since the beginning of radiocommunications. Frequencies are a scarce resource. For decades, engineers have looked for new ways to make a better use of ways of available bandwidth. This means delivering as much content, to as much users as possible, while ensuring as higher quality of service as possible. At this point, where commercial systems operate close to the limit described by Claude Shannon, the demand for more spectrum is even higher than ever. The broadcast industry is right on the middle of the discussion, as its natural operating bands VHF and UHF have raised extraordinary interest for broadband mobile radio access networks. The talk will provide the audience a description of current and expected use of the most popular bands used by terrestrial systems. I will speak about spectrum allocation procedures, including spectrum management models, global and regional regulations and how translate into country legislation. Each band has its own technical advantages and disadvantages, and propagation conditions, as well as required antennas impose specific restrictions to the use of each band. The advantages of each band will be discussed in view of the current allocations to broadband mobile (5G) and terrestrial broadcasting. In both cases, I will cover traditional and new bands, potential future extensions, network planning and propagation implications, receiver performance, antenna restrictions, noise, etc. The talk will finish with a compilation and analysis of the views on spectrum currently published in Europe. The talk will be a tutorial session and the audience is expected to be have basic propagation, network architecture (cellular, DTV) and video coding skills (BsC students on their final year, MsC students and PhDs).

Biography

Pablo Angueira (M'03–SM'11) received the M.S. (1997) and Ph.D. (2002) degrees in telecommunications engineering from the University of the Basque Country (UPV/EHU). He is a full professor at the UPV/EHU. He has been involved in research related to DVB-T, DRM, DVB-T2 and ATSC 3.0 for 20 years and currently focuses on broadcast for 5G. He is an Associate Editor of the IEEE Transactions of Broadcasting and a Distinguished Lecturer of the IEEE BTS.

MAURIZIO MURRONI

Quality of Experience for Advanced Broadcast Services

University of Cagliari, Cagliari, Italy

Abstract

During the last decade, the evolution of the TV market has been terrific. Broadcasters have been facing news challenges to cope with an increasing demand of new services from user's side. With the convergence of second-screen adoption and the abundance of real-time news consumption via social channels, the broadcast landscape underwent a major transformation. Viewers have begun to demand highly customized experiences that meet their individual needs. In short, the evolving wants and needs of the viewer seems to be in the future of broadcast television. In the next years, it is likely that this will become even more evident, with more people demanding customized television experiences through user-generated content and the option of micro bundled packages. To keep up, broadcasters must stay current with the latest innovations to engage with their customers. To this end, there is a need to evaluate the level of enhancement of these experiences and to compare their functionalities and requirements so operators can properly design their networks and regulators can assess the services offered to the audience. This talk will overview the state of the art on Quality of Experience (QoE) for advanced broadcast services.

Biography

Maurizio Murroni received a M.Sc. degree in Electronic Engineering in 1998 and a Ph.D. degree in Electronic Engineering and Computers in 2001 from the University of Cagliari. He was graduate visiting scholar at the School of Electronic Engineering, Information Technology and Mathematics, University of Surrey, Guildford, U.K. in 1998 and a visiting Ph.D. scholar at the Image Processing Group, Polytechnic University, Brooklyn, NY, USA, in 2000. In 2006, he was visiting lecturer at the Dept. of Electronics and Computers at the Transilvania University of Brasov in Romania and in 2011 visiting professor at the Dept. Electronics and Telecommunications, Bilbao Faculty of Engineering, University of the Basque Country (UPV/EHU) in Spain. Currently, is assistant professor at the Department of electrical and Electronic Engineering of the University of Cagliari. Since October 2010, he is coordinator of the research unit of the Italian University Consortium for Telecommunications (CNIT) at the University of Cagliari and since 2016 chair of the IEEE Broadcast Technology Society Italy chapter. Dr. Murroni is co-author of an extensive list of journal articles and peer-reviewed conference papers and received several best paper awards. He served as chair for various international conferences and workshops. He was co-author of the 1900.6-2011 – IEEE Standard for Spectrum Sensing Interfaces and Data Structures for Dynamic Spectrum Access and other Advanced Radio Communication Systems. His research currently focuses on broadcasting, cognitive radio system, signal processing for radio communications, multimedia data transmission and processing.

JOHN COSMAS

Internet of Radio-Light Architecture for the Tactile Internet

Brunel University London, London, UK

Abstract

The first generation of Internet was the Original Computer Data Internet, which connected an almost infinite number of Desk Top Computers, the second was the Mobile Internet, which connected billions of smart phones and laptops, the third was the Internet of Things, which connected trillions of objects and the next generation of Internet will provide very high bandwidths, very low latencies of the order of less than 1ms and will be wireless. This is referred to as the Tactile Internet and will enable haptic communications, which in turn will be a paradigm shift in how skills and labour are digitally delivered globally. This will have an enormous impact on how we will all live and work: lorries carrying freight across continents will be able to be remotely driven, allowing drivers to easily swap shifts and take breaks; surgeons who are located in one hospital will be able to remotely perform surgery at another hospital by manipulating tele-surgical robots; factory machines will be able to be operated from home; virtual reality headsets will be operated without cumbersome wires to receive its video; this list is potentially endless. This technology is still in its infancy but will start to emerge as the results of my "Internet of Radio-Light" project and many other projects start to provide technological solutions and companies start to adopt these to provide commercial products. The previous versions of the Internet will be dwarfed by the emergence of the Tactile Internet, in which ultra-responsive and ultra-reliable network connectivity will enable it to deliver physical haptic experiences remotely. The Tactile Internet will add a new dimension to human-machine interaction through building real-time interactive systems. My talk presents the IoRL architecture as an essential part of the Tactile Internet architecture and presents some use cases that it will enable.

Biography

John Cosmas (M'1989-SM'2008) received the BEng degree in Electronic Engineering in 1978 from Liverpool University and the Ph.D. degree in 1986 from Imperial College, University of London. He is currently a Professor of Multimedia Systems in the College of Engineering, Design and Physical Sciences at Brunel University London. He co-leads the Wireless Networks and Communications Research Centre, is the course director of MSc Advanced Multimedia Design and 3D Technologies and is an associate editor of IEEE Transactions on Broadcasting. His research interests are concerned with the development of Multimedia Networked Systems applied to Future of Broadcasting, Cellular Communications, 2D/3D digital video/graphics media and the synergies between these technologies towards their application towards the benefit of the smart homes, cities environment, health and societies. He has participated in twelve EU (Horizon 2020, IST, RACE and ACTS) research projects and two EPSRC funded research projects since 1986 and he has led three of these (CISMUNDUS, PLUTO and 3D MURALE). He has graduated 29 PhD and 4 MPhil students and published over 80 research journal papers and 180 conference papers. He leads a research team of 10 PhD students, whose research is concerned with management of heterogeneous Visible Light Communications and millimetre wave networks for low latency broadband in buildings, Internet of Things for Health and Safety systems in hospitals 3D MIMO and efficient Software Defined Networks architectures.

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THE CONVERGENCE OF BROADCASTING
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