Centre for Wireless Technology Eindhoven (CWTe)

CWTe 2014 Research Retreat

October 22, 2014

Cognitive Radio & Conscious Behavior; the New Network Philosophy
Speaker: René Vroom, Agentschap Telecom

Abstract:

Enthusiastic people are working with wireless technologies allover, plenty of happy consumers and professionals are enjoying the usage of wireless technologies, in private and public. We see an enormous creative environment wherein people invent, launch and use new applications all the time. Applications as the mobile internet, easy app's on smartphones, live video streaming, intelligent drones , internet of things, e-health, intelligent transport systems, M2M, wireless domotica,… to even wireless power transfer in the very near future.

As technical regulator on spectrum issues it is a challenge to facilitate these growing requests for more spectrum for wireless technologies in a safe, efficient and healthy manner. Together with industry, research institutes and universities we like to be at the front edge to accommodate the need for more and higher spectrum being available for electronic communications. With as less regulative restrictions as possible.

But what about the societal impact of the wireless revolution. Are we becoming ICT-addicted? Have we considered what we call 'the risk of *telekwetsbaarheid*'? Spectrum is not scarce as oil or gas, and spectrum is always re-usable. However we might need to learn how to deal with spectrum in a more consciousness way. Can we avoid 'spilling' frequencies? Why is CR promising in serving the trend to small cells and direct feedback devices? What will 5G bring to the new emerging infrastructure?

New breakthrough technologies are competitive edge in the wireless industry.

Speaker's bio:

René Vroom (49) was holding for almost 16 years managerial positions in supply chain, logistics, information- & planning systems within an international business environment at SCA Molnlycke Hygiene Products. He has been living abroad for 6 years in Munich, Germany. Since 2009 he has become head of Spectrummanagement/Innovation at Agentschap Telecom, the Radiocommunication Agency of the Ministry of Economic Affairs of the Netherlands, dealing with new telecommunication technology trends and the international regulation. Since 2012 he is also head of the Antennebureau, the information office of the Dutch government concerning antennas…….

“Fixed Frequency Oscillator” Novel Approach to Transceiver Architecture Design
Speaker: Kave Kianush, Catena

Abstract:

In this talk will introduce the role and importance of the Local Oscillator (LO) in (wireless) communication, its state-of-the-art and current limitations. In modern wireless systems coexistence of transceivers and power dissipation are serious challenges. This talk will give a fresh look at LO generation. New ideas are discussed that make use of modern CMOS process capabilities – high speed and digital signal processing – to simplify system requirements. Fixed-frequency LO generation is introduced, where with specific divider/ADC configurations, all required LO signals can be generated purely by Variable Divider settings. The many advantages for this method are discussed and examples with the first products based on this technology are given.

Speaker’s bio:

Kave Kianush graduated from London University in 1982. He then joined Philips Research Laboratories in Redhill, UK, where he studied power efficient modulation techniques for transceiver architectures. This work took him to Philips research Labs in Eindhoven, The Netherlands in 1987 and consequently to Philips Semiconductors, System Laboratory at 1990, where he was the Group Leader of the Radio Systems Group. At year 2000, he joined the Catena Group, headquarters in Delft, The Netherlands as the CTO and Vice President. In this period, he has continued to develop new wireless transceiver architectures, thereby growing and strengthening the company. He holds several patents in the fields of power efficient modulation techniques, broadcast radio systems and wireless transceiver architectures.

Perspectives on 5G
Speaker: Ignas Niemegeers, TU/e

Abstract:

As 4G networks are being rolled out worldwide, based on LTE and LTE Advanced, it is becoming clear that the 4G infrastructure will be rapidly outpaced by the demands of applications and, the capabilities and sheer number of devices. Furthermore the infrastructure will have to support more and more critical applications, e.g., in health care and assisted living, demanding a high dependability. The chasm that is opening up cannot be bridged by evolutionary steps of present technologies. Analysts have estimated that what is needed is more than an order of magnitude increase in capabilities, in terms of sustainable data rates and delay times. Furthermore the future infrastructure will have to integrate a variety of wireless technologies, legacy systems, such as 3G, 4G and WLAN, as well as new technologies, such as mm wave and massive MIMO. At the same time business models of telecom operators are under pressure from Internet service providers, such as Google. A new integrative and flexible architecture is needed that takes advantage of new information technologies, such as cloud and virtualization. New wireless communication technologies need to be introduced to meet the performance requirements, in particular mm-wave technology, massive MIMO and antenna beamforming. These will be building blocks of the new 5G infrastructure.

In this talk we will sketch the 5G developments in order to put ongoing and future wireless research in perspective and sketch new opportunities.

Speaker's bio:

I.G.M.M. Niemegeers got a degree in Electrical Engineering from the University of Gent, Belgium in 1970, an MSc in 1972 and a PhD degree in 1978 in Computer Engineering from Purdue University, USA. From 1978 to 1981 he was a system designer at Bell Telephone Mfg. Cy, Antwerp, Belgium. From 1981 to 2002 he was professor at the University of Twente, The Netherlands. From 1995 to 2002 he was Scientific Director of the Centre for Telematics and Information Technology (CTIT) of the University of Twente. From 2002 until 2012 he was chairman of the Telecommunications Department and professor in Wireless and Mobile Communications at Delft University of Technology. Since August 2012 he is emeritus professor at Delft University of Technology and advisor to the Centre for Wireless Technology at Eindhoven University of Technology, The Netherlands..

He was involved in many European research projects and reviewer for many projects. His present research interests are 5G, Radio-over-fiber networks, 60 GHz networking, energy aware networks, and 5G.

Current THz Research and Perspectives to the Industry
Speaker: Aurèle Adam, TU Delft

Abstract:

The Terahertz band, large frequency band between the domain of the micro-electronics and the domain of the infrared light has been known for many decades as a gap in the electromagnetic spectrum: difficult to generate, even more difficult to detect. Confined for a long time to astronomers, the area open up to spectroscopist, material science researchers and even reached the domain of homeland security. A great number of scientist have claimed that in the years 2000's Terahertz will emerge as the next big thing. It is now obvious that THz is not yet the mainstream technology that many hoped. Nevertheless, interesting fundamental research is pursued thanks to large improvements in the instruments and the materials such as graphene for example; a dynamic pool of start-up emerged proposing new THz devices for selected applications and more companies investigates the possibilities of the Terahertz equipment in their chain of production for online monitoring.

The present talk will give you an overview of the current research in the THz domain, including the one done at TUDelft and its current and possible future applications including those for the communication industry.

Speaker's bio:

Aurèle Adam, graduated from Ecole Supérieure d'Electricité (Supélec-Paris) in 2000. He joint the Laboratoire de Genie Electrique de Paris (University Paris VI – CNRS) and the group microelectronic of Erik Kollberg in the Chalmers University of Technology (sweden) for a coupled Ph.D. thesis. The subject was Hot Electron Bolometers for Far Infrared detection using Low or High Temperature Superconductors. In 2003, after his graduation, he moved to Netherlands in the Kavli Institute of Nanoscience at the Delft University of Technology (TUDelft) to work on developing a novel room temperature array detector for TeraHertz (THz) radiation. He also performed many experiments for the characterisation of THz Quantum Cascade Laser.
He was awarded a Veni Grant in 2007 and became Assistant professor in the Optics group of TUDelft in 2008.

His primarily topics are Terahertz spectroscopy, Terahertz generation and detection, in far and near-field. Recently, part of his work has been focused in light/grating interaction for improving absorption of 800nm in order to improve THz generation.

Antenna Design for 60 GHz Radar Applications
Speaker: Bedilu Adela, TU/e

Abstract:

A large bandwidth in the unlicensed 60 GHz band offers the possibility to use in resolution demanding radar sensor applications. Further, at this frequency the possibility of fully integrating the front-end circuits including antenna in to a single chip using mainstream silicon technologies reduces the cost of the sensors. However, this approach of integrating antenna with the chip on the low resistivity silicon degrades the performance the antenna, reducing efficiency and gain and exciting substrate modes. There are various ways to improve the performance, using additional processing in to mainstream or changing the process itself and their by increasing the cost. In this project we investigated the use of PCB environment to improve on-chip antenna performance, which doesn't add any additional cost.

Speaker's bio:

Bedilu Befekadu Adela received the B.Sc. degree in electrical engineering from Arbaminch University, Ethiopia. He received the M.Sc. degree in broad band telecommunications technologies in electrical Engineering and the PDEng. degree in ICT Stan Ackerman's Institute from Technical University of Eindhoven. He is currently pursuing the Ph.D degree at Technical university of Eindhoven.

Laboratory System for Terahertz Imaging Spectroscopy of Tissue Samples
Speaker: Juan Alfaro Zavala, TU/e

Abstract:

Over the past 20 years, terahertz (THz) radiation has drawn considerable attention from the medical field. Many studies have reported that THz imaging can be used in applications such as, spotting the onset of cancer, characterizing burn injuries, and detecting tooth decay. In these kinds of applications, the ability to distinguish between different tissue types is crucial. To better understand the interactions between tissue types and THz radiation, a THz imaging spectroscopy system for analysis of tissue samples is being built at the MsM group. This talk focuses on the design and implementation of this system. We will also present our first images of non-biological samples.

Speaker's bio:

Juan Alfaro is currently a PDEng student in Healthcare Systems Design (HSD). He is working at the Mixed-signal Microelectronics (MsM) group, Faculty of Electrical Engineering, TU/e. He received a M.Sc. degree in Electronics/Telecommunications from University of Gävle (HiG), Sweden, in 2012. He obtained a B.Sc. degree in Electrical Engineering from Universidad Nacional de San Agustin (UNSA), Peru, in 2008. His main research interest is in RF measurements.

Robust 3-D Sensor Cloud Localization from Ultrasound Range Measurements
Speaker: Gijs Dubbelman, TU/e

Abstract:

Advances in electronics manufacturing allow for low-cost mass-produced miniaturized sensor platforms. Such sensor platforms can be deployed in large quantities, i.e. several thousand, thereby forming what we call sensor clouds.

In this presentation we discuss a novel robust method to estimate the 3-D locations of sensor platforms in such sensor clouds. Our localization method is designed for specific applications that are related to 3-D mapping of subsurface difficult-to-access liquid environments. Such applications include pipe infrastructure mapping and oil well mapping, which both have high industrial relevance.

Most of such subterranean applications do not allow obtaining the locations of sensor platforms on basis of beacons (e.g. GPS satellites, WIFI routers, or GSM pylons), either with or without a priori known locations. Our method therefore estimates the 3-D sensor platform locations solely from direction-free range measurements, i.e. range-only measurements, between sensor-platforms. It does not rely on beacons, anchor nodes, or any other form of a priori known 3-D information.

The presented research is carried out in a cooperation between Eindhoven University of Technology and INCAS3.

Speaker's bio:

Dr. **Gijs Dubbelman** is a research fellow with the Eindhoven University of Technology and an expert in 3-D computer vision for intelligent vehicle applications. He obtained his BSc. degree in Information and Communication Technology and his MSc. Degree cum laude in Artificial intelligence form the University of Amsterdam. In 2011 he obtained his PhD. from the University of Amsterdam on the topic of intrinsic statistical techniques for robust pose estimation. He performed his PhD. research in close cooperation with Intelligent Imaging department of the national organization of applied scientific research of the Netherlands (TNO). In 2011 and 2012 he was a member of the internationally renowned Field Robotics Center of Carnegie Mellon's Robotics Institute, where he performed research on 3-D computer vision systems for autonomous robots and vehicles. Currently, he is continuing this line of research at the signal processing group of Eindhoven University of Technology. He has designed and developed state-of-the-art computer vision algorithms for obstacle detection, ego-motion estimation, and simultaneous localization and mapping. For more information please visit his professional website: www.gijsdubbelman.com.