

Centre for Wireless Technology Eindhoven (CWTe)

CWTe 2012 Research Retreat

October 9, 2012



Key note: Optimizing Shared Awareness in Communication Constraint Sensor Networks

Speaker: Dr. ir. Leon Kester (TNO)

Abstract:

In a wide variety of applications such as, surveillance with a network of camera's, platooning or military operations, a shared awareness of the situation is crucial. However, usually not all information that is valuable for this shared awareness can be exchanged due to constraints in communication. To make matters worse, what is valuable information and what the constraints in communication resources are, may continuously change depending on the actual situation.

In this presentation is discussed what system models are appropriate to design these systems and how each entity in the network can continuously reason about what information to exchange.

Speaker's bio:



Leon Kester has a background in sensor and information processing and fusion and artificial intelligence. His research focus now at TNO is on distributed sensor systems, in particular the self-organization and self-optimization of intelligent sensor systems.

Key note: Sensing Terra Incognita

Speaker: Dr. Heinrich Woertche (INCAS³)

Abstract:

Sensor systems have become an integral of our daily life and are of increasing importance for global issues ranging from the efficient use of natural resources to improving human health and fitness. INCAS3 is focusing on high risk-high gain industrial and social problems requiring complex sensor technology solutions.

I will present two of our research projects: the development of micro-sensors that can be inserted into oil reservoirs, collect relevant data, and resurface and the development of audio devices capable of predicting the human evaluation of an acoustic environment. While the first application is geared towards providing information on specific formations in underground oil reservoirs, so far considered terra incognita, requires the latter one the application and the implementation of ethnographic and anthropological techniques on sensor level, technology so far deeply hidden in terra incognita of multidisciplinary research.

Speaker's bio:



Heinrich Wörtche (1962) has always been interested in the development and application of advanced technologies. He has been involved for more than twenty years in the development of tools for physical research, training scientists, and organizing large-scale, international scientific research cooperation.

Wörtche earned his Ph.D. in natural sciences from the Technical University of Darmstadt. He continued his career at the University of Münster, first as a postdoc researcher and then as a university lecturer. In 2000 he joined the Nuclear Physics Accelerator Institute at the University of Groningen. Wörtche has worked with leading research institutions in Germany, Canada, Switzerland, Japan, Sweden, and France. Since 2009 he is Scientific Director of INCAS3.

Key note: Broadband mobile communications for mission critical applications

Speaker: Frank Brouwer (WMC)

Abstract:

Mobile communications is truly vital for Public Safety applications. Narrow band applications like speech and text messages are well covered using TETRA. But the next generation network for Public Protection and Disaster Relief must also cover broad band applications including photo and video, command and control applications, and large amounts of sensor data. The data rate can be provided by public operators, but living up to the extremely high reliability and resilience requirements is something else. Worldwide activities include a strong debate on frequency allocations, designing mission critical requirements into public systems, PPP business models, and likewise. The development train for broadband communication for mission critical applications is coming up to speed, including interesting involvement from Dutch participants.

Speaker's bio:



Frank Brouwer received his degree as M.Sc. from Delft University of Technology in 1989, graduating on the capacity analysis of radio based data communications systems. Since 1991 he held various research and system engineering positions at Ericsson. In 2001 Ericsson granted him the title of Senior Specialist in the area of Radio Network Algorithms and Performance Evaluation. Frank is one of the pioneers of the Twente Institute of Wireless and Mobile Communications (WMC) that started in 2003.

At WMC he executes diverse research, development and consultancy projects related to radio network technology, in particular directed to public safety applications. He has transformed this into WMC's product line FIGO. Since 2008 he combines business and technology as FIGO Product Manager and CTO. Frank is committed to create reliable radio based communication systems for mission critical applications.

Reduction of multimode transceivers power consumption by Nonlinear Interference Suppression

Speaker: Hooman Habibi (TU/e)

Abstract:

Simultaneous operation of multiple transceivers in a small device leads to the introduction of strong interference by the local transmitter of one standard on the local receiver of another standard. The current approach for keeping the receiver functional in the presence of strong interferers is to increase the linear dynamic range of the receiver, which increases the power consumption. Since the handheld devices are battery operated, increasing the power consumption is highly undesirable.

The goal of the DECAFE project is to make the receiver capable of handling a strong local interferer while keeping the power consumption as low as possible. To achieve this goal we are exploring a mixture of analog and digital techniques. In this presentation, we discuss using a digitally tuned RF circuit to suppress the strong local interferer in an early stage of the receiver. This research is done in collaboration with MsM group at TU/e and IC Design Group at University of Twente.

Speaker's bio:



Hooman Habibi was born in Iran, in 1981. He obtained the B.Sc. and M.Sc. degrees in electronics and communication systems from Sharif University of Technology, Iran, in 2004 and 2007, respectively. Since March 2009, he is a PhD candidate at the Signal Processing Systems group of the Electrical Engineering Department of Eindhoven University of Technology. The goal of his research is the development of mixed analog and digital techniques to enable mitigation of strong interferers by RF receivers.

Technologies for integrated millimeter-wave antennas: An endless controversy?

Speaker: Ulf Johannsen (TU/e)

Abstract:

The release of the unlicensed 60 GHz band tackles the increasing demand for more bandwidth in the wireless consumer electronics market. In order to meet the cost requirements of this market, many research groups have worked towards 60 GHz front-end electronics in mainstream silicon technologies, i.e., CMOS and BiCMOS. However, the technology choice for suitable antennas has not been as unitary and is controversially discussed. While there is a wide consensus that the antenna should be integrated in the same package with the front-end integrated circuit (IC), there are three main approaches on the realization: Antenna-in-Package, Antenna-on-Chip and a hybrid approach. At the Eindhoven University of Technology (TU/e) all three integration approaches have been investigated in order to explore the challenges and potentials of each integration technology with respect to millimeter-wave antenna integration.

This presentation summarizes nearly four years of integrated millimeter-wave antenna research at the TU/e by providing a concise overview of the major pros and cons that have emerged during this time. Furthermore, possible application examples are given for each antenna concept.

Speaker's bio:



Ulf Johannsen was born in 1984 in Flensburg, Germany. He obtained his Dipl.-Ing. degree in 2009 from Technische Universität Hamburg-Harburg (TUHH) in Hamburg. As part of his studies, he completed two internships at NXP Semiconductors in Shanghai, China, and in Nijmegen. Since 2009 he has been working as a Ph.D.-candidate in the Electromagnetics group at the Technische Universiteit Eindhoven (TU/e). His main research focus is concentrated on technologies for integrated millimeter-wave antennas. Throughout his research, he has collaborated with several universities, research institutes as well as international and national companies and he completed an exchange project with IMST GmbH in Kamp-Lintfort, Germany. He was the organizer of bi-monthly EM colloquia and is currently the chair-person of the organization committee of the fifth European Microwave Week Student Challenge.

Ulf Johannsen is a member of the VDE and a Student Member of the IEEE Antennas & Propagation Society, for which he also serves as reviewer for journal articles.

Wireless Energy Transfer for battery-less sensors

Speaker: Hao Gao (TU/e)

Abstract:

With the advancement of technology wireless sensor networks are starting to become widely used. However, further growth is restrained by the need to use limited life time batteries in such small sized sensors. To resolve this issue wireless power transfer has been investigated. The resulting new technology will make it possible to build low cost, medium range monolithic sensors that can be deployed in a.o. home automation, lighting, automotive, security, and healthcare.

This presentation will discuss some of the results of this work, where a monolithic wireless sensor has been created without any external components, which scavenges RF energy from the environment, processes data on chip and then transmits information wirelessly.

Speaker's bio:



Hao Gao was born at 1984 in China. He obtained the B.Sc degree at the Southeast University, in 2006, the M.Sc degrees at the Delft University of Technology in 2008 and a PD.Eng at the Eindhoven University of Technology in 2010. Currently, he is pursuing the Ph.D degree at the Mixed-Signal-Microelectronics group of the Eindhoven University of Technology.

From 2005 to 2006, he worked in the Institute of RF-&OE-ICs of SEU, and from 2007 to 2008 at Electronics Research Laboratory of TUD. He was the recipient of the best paper reward at the 2011 IEEE Radio Wireless Week in Phoenix, and co-recipient of the high quality paper award for ICICS 2011 in Singapore. His research interests include millimeter wave RF IC design, ultra-low power radio ICs and wireless power transfer.

Towards Low Low Low-Power

Speaker: Prof. José Pineda de Gyvez (TU/e, NXP)

Abstract:

Digital ubiquity, along with a lift in semiconductor utilization for consumer electronics and a miniaturization of equipment are key issues to attain digital convergence. This is possible if distinct high-performance, (ultra) low operating power, and low standby power devices are assimilated in design technologies that concurrently exploit many degrees of freedom. One cannot think that in a few years, without power management, any kind of competitive chip can be marketed in the entire application field. No computing device, from chips in hearing aids all the way to massively parallel computer clusters will be allowed to waste power. The compute power requirements on new emerging applications grow almost exponentially and power becomes an issue everywhere. Think of the electrical bill if you are not careful with the armada of home computers including digital TV receivers you run all day. This presentation will address state of the art low power techniques and an overview of their application in distinct fields.

Speaker's bio:



José Pineda de Gyvez received the Ph.D. degree from the Eindhoven University of Technology, in 1991. From 1991 until 1999 he was a Faculty member in the Department of Electrical Engineering at Texas A&M University, USA. He is an IEEE Fellow, and also a Fellow at NXP Semiconductors where he leads the research program on variability tolerant designs. Since 2006 he also holds the professorship “Deep Submicron Integration” in the Department of Electrical

Engineering at the Eindhoven University of Technology. Dr. Pineda de Gyvez has been Associate Editor in IEEE Transactions on Circuits and Systems Part I and Part II, and also Associate Editor for Technology in IEEE Transactions on Semiconductor Manufacturing. He is also a member of the editorial board of the Journal of Low Power Electronics. Dr. Pineda has co-authored more than 100 publications in the fields of testing, nonlinear circuits, and low power design. He is (co)-author of four books, and has a number of granted patents. Dr. Pineda’s research has been funded by the Dutch Ministry of Science, US Office of Naval Research, US National Science Foundation, Holst Centre, among others.