BodyNets 2010

The Fifth International Conference on Body Area Networks

September 10 – 12, 2010
Corfu Island, Greece
http://www.bodynets.org/

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Message from the BodyNets 2010 Chairs

Welcome to the **Fifth International Conference on Body Area Networks (BodyNets 2010),** which will be held in Corfu, Greece on September 10-12, 2010**.** This year's Conference continues its tradition of being the premier forum for presentation of results on cutting-edge research in Body Area Networks (BAN). The mission of the conference is to share novel basic research ideas as well as experimental applications in the BAN area in addition to identifying new directions for future research and development. BodyNets 2010 gives researchers a unique opportunity to share their perspectives with others interested in the various aspects of BAN. The conference consists of four symposia that cover a broad range of research aspects. In addition, the program includes two outstanding keynote speakers from academia and industry: Dr. William Scanlon and Dr. Byung K. Yi. A panel session on "Wireless body area networks: from theory to practice" will surely provoke thoughtful discussions. There will also be two tutorials given free of charge to all BodyNets 2010 attendees. We hope that the conference proceedings will serve as a valuable reference to researchers and developers in the area.

This year, we have received more than 80 paper submissions from all over the world. All papers received rigorous peer reviews from our Technical Program Committee (TPC). After carefully examining all the received review reports, the TPC finally selected 34 regular papers for presentation at the conference and publication in the ACM proceedings. In addition, four demo papers and three poster papers will be presented at the conference.

Putting together BodyNets 2010 was a team effort. First of all, we would like to thank the authors for providing the content of the program. We would also like to express our gratitude to the TPC and reviewers, who worked very hard in reviewing papers and providing suggestions for their improvements. We would like to thank our financial sponsor ICST, corporate sponsor LG Electronics, technical sponsors IEEE EMB and CREATE-NET, and the technical cooperation of ACM, for their support in making BodyNets 2010 a successful event. For a list of all individuals who have contributed to BodyNets 2010, please visit the conference website: http://www.bodynets.org/

We hope that you will find this year's program interesting and thought-provoking and the conference will provide you with a valuable opportunity to share ideas with other researchers from around the world. We look forward to greeting you personally at BodyNets 2010!

Victor Leung General co-Chair
Athanasios Vasilakos, General co-Chair

BodyNets 2010 Keynote Speakers:

Understanding and Exploiting Physical Layer Characteristics to Create New Opportunities for Bodynets

Abstract: The topical interest in wireless devices and systems operating in close proximity to and in conjunction with the user's body continues to grow unabated. This talk will show how the unique, and often challenging, characteristics at the physical layer can be used to our advantage in developing new ideas and applications for wireless bodynets. This physical layer starting point can both inform, and can be exploited by, all layers of the stack to deliver optimum communications performance even under tight resource constraints. Recent work on antennas and propagation, localisation and interference sensing and mitigation in the context of bodynets will be presented and discussed. This will show that the physical layer remains at the heart of efforts to improve wearable applications, for example, by optimising the use of the available spectrum and improving energy efficiency in both devices and systems. Finally, the talk will conclude with convincing arguments that 'you will be at the centre of your wireless future'

Bio: Dr. William G. Scanlon is a Full Professor and Chair of Wireless Communications at Queen's University, Belfast, UK and Chair of Short Range Radio at the University of Twente, The Netherlands. He holds a B.Eng. degree in electrical engineering and a Ph.D. degree in electronics from the University of Ulster, UK. He has been actively researching body centric communications since the early 1990's having conducted pioneering work on UHF radio based medical implant communications and physical layer and system aspects of human and animal biotelemetry applications. Prior to starting his academic career he had 10 years of industrial experience, having worked as a Senior RF Engineer for Nortel Networks, as a Project Engineer with Siemens and as a Lighting Engineer with GEC-Osram. His research interests include personal and body-centric communications including the use of millimetre wave links, wearable antennas, RF and microwave propagation, channel modelling and characterization, wireless networking and protocols and wireless networked control systems. More recent work has focused on secure systems for personnel tracking and ad-hoc localisation using body-to-body networks. He has published over 160 technical papers in major IEEE/IET journals and in refereed international conferences. He served as a keynote speaker for the European Workshop on Conformal Antennas (2007), Co-Chaired the 2009 Loughborough Antennas and Propagation Conference and he has acted as invited speaker and session chair at numerous other national and international conferences. Professor Scanlon received a Young Scientist award from URSI in 1999, he is a prolific reviewer for IEEE/IET journals and conferences and other major conferences. He is a Director of WirelessLAB (Ireland) and a member of the IEEE International Committee on Electromagnetic Safety (ICES) and the IASTED International Committee on Telecommunications.

On u-Healthcare through 4G Cellular Network: Reliability and Security

Abstract: The recent advance in multimedia signal processing and wireless communication technology has opened up promising market potentials for various innovative and new applications. One of these applications is certainly healthcare, which will be enabled through the high-speed, reliable and secure manner of wireless communication. Today, it is not an imaginary scene any more that we can see people enjoying their lives over "SmartPhone". The use of wireless technologies today is getting more and more popular and the applications of them are becoming more pervasive not only in our normal living conditions but also in our abnormal situations, such as in case of medical needs. Today's healthcare is enhancing its objective and scope to "preventive" healthcare, which clearly reflects the tendency of people that they want to live better and longer and to be active and moving around whenever they want to. As of March of 2010, the 3G subscriptions are still increasing, with 3GPP subscriptions reached more than 620 millions in the Western Hemisphere. The 3GPP and IEEE 802.16 are now actively developing the machine-type communication (MTC) radio interface technology, which will serve many purposes, such as metering, health, and security. Healthcare is expected to be ubiquitous, which is going to be technically feasible soon through the next generation cellular technology. In this talk, we will go through the recent trend of wireless communication technology development and the role of the wireless communication technology segment in future u-healthcare paradigm. More specifically, we will see how properly the next generation cellular technology can serve these u-healthcare purposes, from the perspectives of network convergence, connection reliability, security, and market potentials.

Bio: Dr. Byung K. Yi (B. K.), Senior Executive Vice President of LG Electronics, has over thirty two years of experience in research and development of space systems and communication systems. He is leading the LGE MR, LG Electronics North America Research Lab, in San Diego, developing mobile handset units for North American carriers and conducting researches on the next generation wireless communication systems. He has been working on currently deployed third generation systems and upcoming forth generation systems. He had served as a chair of 3GPP2 TSG-C, developing cdma2000 air interface specifications and served as a co-chair of the Working Group 5 of 3GPP2 TSG-C, developing 1xEV/DV wireless standards. Under his leadership, TSG-C published three important air-interface industrial standards, cdma2000 Rev. D, High Rate Packet Data (HRPD) Rev. A and Rev. B.

BodyNets 2010
Industry Panel

Wireless Body Area Networks: From Theory to Practice

All BodyNets participants are invited to attend

Friday, September 10, 2010
17:10-18:10

Panelists

Dr. Byung K. Yi

LG Electronics   - *USA*

Dr. William Scanlon

Queen's University - *North Ireland (Belfast)*

Dr. Thomas Falck

Philips Research– the *Netherlands*

Dr. IlangkoBalasingham

Oslo University Hospital & NTNU - *Norway*

During this 60-minute plenary event, the panelists will present their views and discuss with the audience the following issues:

- Energy Problems
- Wireless body sensors for health and well-being from an industrial perspective
- On/in-body sensor networks for monitoring and therapeutic purposes
- Myth and Reality of the Body Area Network

Moderator: Dr. PanosNasiopoulos - UBC, Canada

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Technical Program

Friday, 10th September 2010 (Room: ITHACA**)**

8:15-18:00	**Registration**
8:55-9:00	**Welcome Address:** Dr. Victor C.M. Leung, Dr. Athanasios V. Vasilakos, General Chairs; Dr. Thomas Falck, TPC Chair.
9:00-10:00	**Keynote I** • **Understanding and Exploiting Physical Layer Characteristics to Create New Opportunities for Bodynets** Dr. William Scanlon, Queen's University Belfast
10:00-11:20	**Session 1 - Best Paper Candidates Session (Chair: Foad Dabiri, University of California Los Angeles)** • **Body Area Wireless Sensor Networks for the Analysis of Cycling Performance** Raluca Marin-Perianu (Pervasive Systems Group, University of Twente), Mihai Marin-Perianu (Inertia Technology), David Rouffet (Institute of Sport Exercise and Active Living - School of Sport and Exercise Science - Victoria University), Simon Taylor (Institute of Sport Exercise and Active Living - School of Sport and Exercise Science - Victoria University), Paul Havinga (Pervasive Systems Group, University of Twente), Rezaul Begg (Institute of Sport Exercise and Active Living - School of Sport and Exercise Science - Victoria University), Marimuthu Palaniswami (University of Melbourne) • **Secure Handshake with Symptoms-matching: The Essential to the Success of mHealthcare Social Network** Rongxing Lu (University of Waterloo), Xiaodong Lin (University of Ontario Institute of Technology), Xiaohui Liang (University of Waterloo), Xuemin (Sherman) Shen (University of Waterloo) • **Practical Comparison of Ranging in IEEE 802.15.4 and IEEE 802.15.4a Medical Body Sensor Networks** Dries Neirynck (Stichting IMEC Nederland), Kathleen Philips (Stichting IMEC Nederland), Harmke De Groot (Stichting IMEC Nederland), Javier Espina (Philips Research Europe) • **Context-Aware Body Area Networks (CABAN) for Interactive Smart Environments: Interference Characterization** Sean Heaney (The Queen's University Belfast), Emi Garcia-Palacios (The Queen's University Belfast), William Scanlon (The Queen's University Belfast)
11:20-12:30	**Coffee Break & Demonstration & Poster Session (Chair: Raul Chavez-Santiago, Oslo University Hospital)**

	- **Demo of the Biomedical Wireless Sensor Network (BWSN) Platform** K. Oyri and S. Stoa - **Demonstration of A Novel Wireless Three-pad ECG System for Generating Conventional 12-lead Signals** Huasong Cao (The University of British Columbia), Haoming Li (The University of British Columbia), Leo Stocco (The University of British Columbia), Victor Leung (The University of British Columbia) - **Channel modeling testbed for body sensor network** G. R. Tsouri and J. Wilczewski - **Visual Communication in Wireless Sensor Network using 6LoWPAN** M-L. Pham, T. A. Ramstad and I. Balasingham - **DynAGreen: Hierarchical Dynamic Energy Efficient Task Assignment for Wireless Healthcare Systems** Priti Aghera (University Of California, San Diego), Dilip Krishnaswamy (Qualcomm Research Center, San Diego, USA), Tajana Rosing (University Of California, San Diego, USA) - **Body Area Network for First Responders - a Case Study** Krzysztof Piotrowski, Anna Sojka, and Peter Langendoerfer - **Node Mobility Support in Body Sensor Networks** Bart Braem (University of Antwerp - IBBT), Peter De Cleyn (University of Antwerp - IBBT), Chris Blondia (University of Antwerp - IBBT)
12:30-13:30	**Lunch** **(Location:** pool restaurant**)**
13:30-15:30	**Session 2: Communications and Networking I** **(Chair: Wei Chen, Eindhoven University of Technology)** - **Evaluating Relaying Scheme for BAN TDMA MAC Using a Space-Time Dependent Channel Model** Mickael Maman (CEA LETI Minatec), Laurent Ouvry (CEA LETI Minatec) - **A Single Conductive Surface as Communication Media for Networked Devices** Josep Rius (Univ. Politecnica de Catalunya) - **Low Power High Bandwidth Power-Line Communication Network for Wearable Applications** Michel Chedid (Saab Training Systems), Llja Belov (Jonkoping University), Peter Leisner (Institute of Sweden) - **Mobile Device Aided Cooperative Transmission for Body Area Networks** Rong Yu (South China University of Technology), Yan Zhang (Simula Research Laboratory), Ruchao Gao (South China University of Technology) - **Low Power U-Healthcare Services Using MDC Packet-Level Scheduling for In/On-Body Wireless Multi-Hop Links in a Medical Body Area Network**

	Ki-Dong Lee (LG Electronics Mobile Research), Sang G. Kim (LG Electronics Mobile Research), Byung K. Yi (LG Electronics Mobile Research) • **A Robust Protocol Stack for Multi-hop Wireless Body Area Networks with Transmit Power Adaptation** Majid Nabi (Eindhoven University of Technology), Twan Basten (Eindhoven University of Technology, Embedded Systems Institute), Marc Geilen (Eindhoven University of Technology), Milos Blagojevic (Eindhoven University of Technology, Embedded Systems Institute), Teun Hendriks (Embedded Systems Institute)
15:30- 15:50	**Coffee Break**
15:50- 17:10	**Session 3: Communications and Networking II** **(Chair: Ki-Dong Lee, LG Electronics Mobile Research)** • **Design and Evaluation of A Novel Wireless Three-pad ECG System for Generating Conventional 12-lead Signals** Huasong Cao (The University of British Columbia), Haoming Li (The University of British Columbia), Leo Stocco (The University of British Columbia), Victor Leung (The University of British Columbia) • **Adaptive and Personalized Body Networking** Nikola Serbedzija (Fraunhofer FIRST), Gian Mario BERTOLOTTI (Dip. Informatica e Sistemistica - Universita' di Pavia) • **Contention vs. Polling: A Study in Body Area Networks MAC Design** Athanassios Boulis (NICTA), Yuri Tselishchev (NICTA and School of IT University of Sydney) • **Performance Analysis of a BPSK-BPPM UWB Physical Layer for Wireless Body Area Networks** Stephane MEBALEY EKOME (Orange Labs; Universite Paris-Est, ESYCOM-ESIEE), Jean Schwoerer (Orange Labs), Genevieve Baudoin (Universite Paris-Est, ESYCOM- ESIEE), Martine Villegas (Univertsite Paris-Est, ESYCOM-ESIEE)
17:10- 18:20	**Panel Discussion: Wireless Body Area Networks: From Theory to Practice** • **Moderator: Panos Nasiopoulos** • **Panelists: Ilangko Balasingham, Thomas Falck, William Scanlon, Byung K. Yi**
19:00- 21:00	**Welcome Reception** **(Location:** Kefi lounge and terrace overlooking the pool/sea and gardens**)**

Saturday, 11th September 2010 (Room: ITHACA**)**

8:30- 18:00	**Registration**

9:00-10:00	**Keynote II** • **On u-Healthcare through 4G Cellular Network: Reliability and Security** Dr. Byung K. Yi, LG Electronics Mobile Research, San Diego
10:00-11:00	**Session 4: Systems and Technology I** **(Chair: Alexander Young University of Edinburgh)** • **An Ultra Wideband Propagation Model for Wireless Cardiac Monitoring Devices** Raul Chavez-Santiago (The Interventional Centre, Oslo University Hospital), Ali Khaleghi (The Interventional Centre, Oslo University Hospital), Ilangko Balasingham (The Interventional Centre, Oslo University Hospital) • **Microsensors for Continuous Monitoring of Heart Function** Lars Hoff (Vestfold University College), Kristin Imenes (Vestfold University College), Lars Fleischer (Vestfold University College), Per Steinar Halvorsen (Oslo University Hospital. The Interventional Centre), Andreas Espinoza (Oslo University Hospital. The Interventional Centre), Espen Remme (Oslo University Hospital. The Interventional Centre), Ole Jakob Elle (Oslo University Hospital. The Interventional Centre), Erik Fosse (Oslo University Hospital. The Interventional Centre) • **Candidate Estimators for Aorta Diameter Estimation Using Monostatic Radar** Lars Solberg (Interventional Centre, Institute for Clinical Medicine, Oslo University Hospital), Ilangko Balasingham (Interventional Centre, Institute of Clinical Medicine, University of Oslo and Interventional Centre, Oslo University Hospital and Department of Electronics and Telecommunications, Norwegian University of Science and Technology (NTNU), Trondheim, Norway), Svein Hamran (Forsvarets forskningsinstitutt, PO Box 25, 2027 Kjeller, Norway; and Department of Geosciences, University of Oslo, PO Box 1047 Blindern, 0316 Oslo, Norway)
11:00-11:20	**Coffee Break**

11:20-13:00	**Session 5**: **Medical Applications** **(Chair: Xiaodong Lin, University of Ontario Institute of Technology)** • **A Biomedical Wireless Sensor Network for Hemodynamic Monitoring** Karl Oyri (The Interventional Centre, Oslo University Hospital and Faculty of Clinical Medicine, University of Oslo), Stig Stoa (The Interventional Centre, Oslo University Hospital and Faculty of Clinical Medicine, University of Oslo), Erik Fosse (The Interventional Centre, Oslo University Hospital and Faculty of Clinical Medicine, University of Oslo) • **Body Area Networks for Ambulatory Psychophysiological Monitoring: A Survey of Off-the-Shelf Sensor Systems** Katarzyna Wac (Carnegie Mellon University), Anind Dey (Carnegie Mellon University), Athanasios Vasilakos (University of Western Macedonia) • **Monitoring Body Temperature of Newborn Infants at Neonatal Intensive Care Units Using Wearable Sensors** Wei Chen (Department of Industrial Design, Eindhoven University of Technology), Sietse Dols (Department of Industrial Design, Eindhoven University of Technology, The Netherlands), Sidarto Bambang Oetomo (Neonatal Intensive Care Unit, Moxima Medical Center, Veldhoven, The Netherlands; Department of Industrial Design, Eindhoven University of Technology, The Netherlands), Loe Feijs (Department of Industrial Design, Eindhoven University of Technology, The Netherlands) • **Towards implementing a fully wireless multiple-lead electrocardiograph** Gill R. Tsouri (Department of Electrical Engineering, Rochester Institute of Technology) • **Grouped Variable Model Selection for Heterogeneous Medical Signals** Jamie Macbeth (UCLA), Majid Sarrafzadeh (UCLA) • **Wireless Body Sensor Design for Intra-Vaginal Temperature Monitoring** Joao Garcia (Institute of Telecommunications, University of Beira Interior), Joao Caldeira (Institute of Telecommunications, University of Beira Interior, IPCB), Joel Rodrigues (Instituto de Telecomunicacions, University of Beira Interior)
13:00-14:00	**Lunch** **(Location:** pool restaurant**)**
14:00-16:00	**Session 6: Systems and Technology II** **(Chair: Katarzyna Wac, Carnegie Mellon University)** • **From Posture to Motion: The Challenge for Real Time Wireless Inertial Motion Capture** Alexander Young (University of Edinburgh) • **Characterizing and Minimizing Synchronization and Calibration Errors in Inertial Body Sensor Networks**

	Shanshan Chen (University of Virginia), Jeff Brantley (University of Virginia), Taeyoung Kim (University of Virginia), John Lach (University of Virginia)
	WBAN system using GPPM algorithm for IEEE 802.15.TG6 Jae Ho Hwang (WITLAB), Jae Moung Kim (WITLAB) **Behavioral Reconfigurable Compression in Body Sensor Networks** Foad Dabiri (University of California Los Angeles), Hyduke Noshadi (University of California Los Angeles), Majid Sarrafzadeh (University of California Los Angeles) **A Mobile Core-Body Temperature Monitoring System on Android** Orlando Pereira (Department of Informatics, University of Beira Interior, Covilha, Portugal), Joao Caldeira (Department of Informatics, University of Beira Interior, Covilha, Portugal), Lei Shu (Graduate School of Inf. Science and Technology, Osaka University of Technology, Japan), Joel Rodrigues (Instituto de Telecomunicacoes, University of Beira Interior, Covilha) **Unsupervised Learning in Body-Area Networks** Nicola Bicocchi (University of Modena and Reggio Emilia), Matteo Lasagni (University of Modena and Reggio Emilia), Marco Mamei (University of Modena and Reggio Emilia), Andrea Prati (University of Modena and Reggio Emilia), Rita Cucchiara (University of Modena and Reggio Emilia), Franco Zambonelli (University of Modena and Reggio Emilia) **A Novel Approach to Multi-Sensor Data Synchronization Using Mobile Phones (Short Paper)** Jonas Wahslen (KTH), Thomas Lindh (KTH), Martin Eriksson (KTH)
16:00-16:20	**Coffee Break**
16:20-18:00	**Session 7: Wearable Computing** **(Chair: Nikola Serbedzija, Fraunhofer FIRST)** **A Wearable Motion Tracker** Fahad Moiz (University of Missouri-Kansas City), Daniel Leon-Salas (University of Missouri-Kansas City), Yugyung Lee (University of Missouri-Kansas City) **A Wearable Platform utilizing off-the-shelf Components and performing Quality Analysis of Physiological Data** Alexandros Pantelopoulos (Wright State University), Nikolaos Bourbakis (Wright State University) **Battery-Aware Power Management Techniques for Wearable Haptic Nodes** Mahsan Rofouei (UCLA), Elisabetta Farella (Universita di Bologna), Davide Brunelli (University of Trento), Majid Sarrafzadeh (University of California, Los Angeles), Luca Benini (Universita di Bologna) **PAMS: A Wearable Physical Activity Monitoring System for**

	Continuous Motion Capture in Free-living Environments Sheng Hu (Michigan Technological University), Xi Chen (Michigan Technological University), Jindong Tan (Michigan Technological University) • **DarSens: A Framework for Distributed Activity Recognition from Body-Worn Sensors** Michael Haslgrubler (Institute for Pervasive Computing, Johannes Kepler University Linz), Clemens Holzmann (Department of Mobile Computing, Upper Austria University of Applied Sciences)
19:00-22:00	**Banquet** (**Location:** Eptanissa grill restaurant and terrace**)**

Sunday, 12th September 2010 (Room: ITHACA & LEFKAS)

8:45-10:00	**Registration**
9:00-12:00 (break in the middle)	**Tutorial I** • **Title**: A practical guide to MAC implementation and general MAC design guidelines for Body Area Networks • **Speaker:** Dr. Athanassios Boulis **Tutorial II** • **Title**: "What you Like is What you Get" - Engineering Highly Personalized User-centric Systems • **Speaker:** Dr. Nikola Serbedzija
12:00	**Lunch**

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