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## 10th EAI International Conference on Body Area Networks

SEPTEMBER 28–30, 2015 | SYDNEY, AUSTRALIA

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Sydney Harbour

*Photograph by Lyndsey Chen-Yang*

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### 10th EAI International Conference on Body Area Networks

#### POSTER REQUIREMENTS:

**the recommended format:** 36"x48",

**orientation:** landscape view

[If you are an Accepted Author and need a Visa Letter find out more information HERE.](#)

You are cordially invited to participate in the 10th International Conference on Body Area Networks (BodyNets 2015) to be held in Sydney, Australia during September 28 to 30 September (Monday-Wednesday) 2015.

BodyNets 2015 aims to provide a world-leading and unique opportunity for bringing together researchers and practitioners from diverse disciplines to plan, analyze, design, build, deploy and experiment with/on body area networks (BANs).

Sponsored by EAI and CREATE-NET, BodyNets 2015 will feature the state-of-the-art keynote speeches, parallel technical sessions, focused special tracks, interactive demo/poster sessions, informative co-located workshops and entertaining social functions. Here are several important notes and announcements:

The technical program will consist of four main tracks

1. Wearable Computing
2. Embedded Devices and Medical Applications
3. Communications and Networking
4. Systems and Applications- Ambient Intelligence

The program will also consist of the following special tracks:

- ST1: Wireless Implantable Antennas (WIAN)
- ST2: Human Body Communications (HBCM)
- ST3: Privacy, Security and Trust in Body Area Networks (PSTB)
- ST4: Antennas and Propagation in Body Area Networks (APBN)
- ST5: Unconventional Intrabody Communication (UNIC)
- ST6: Cloud-assisted Body Area Networks (CBAN)
- ST7: Sensors and Algorithms for Human Motion Analysis and Classification (SAHM)
- ST8: Body Area NanoNETworks: Electromagnetic, Materials and Communications (BANN-EMC)

Each track has regular and short paper presentations.

All accepted conference and workshop papers will be published in the Conference Proceedings (ACM Digital Library).

The proceedings are submitted for inclusion to the leading indexing services: **DBLP, Google Scholar, Thomson Scientific ISI Proceedings, EI Elsevier Engineering Index, CrossRef, Scopus**, as well as



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The BodyNets 2015 organizers are working hard to make this conference a great success and memorable for everyone. We very much look forward to meeting you in Sydney in September 2015.

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### Call for Papers

#### 10th International Conference on Body Area Networks (BodyNets 2015), September 28–30, 2015, Sydney, Australia

BodyNets 2015 aims to provide a world-leading and unique opportunity for bringing together researchers and practitioners from diverse disciplines to plan, analyse, design, build, deploy and experiment with/on body area networks (BANs).

### TOPICS

We are soliciting high-quality original papers in the following topics (but not limited to):

#### 1. Wearable Computing

Chaired by Giancarlo Fortino (University of Calabria)

- Pervasive user interface
- Context and situation awareness
- Augmented reality
- Sensory augmentation
- Motion detection and activity recognition
- User modeling and personalization

#### 2. Embedded Devices and Medical Applications

Chaired by Gang Zhou (College of William and Mary)

- High-confidence medical devices
- Integration of medical devices with healthcare systems
- Medical device plug-and-play
- Assistive technologies for independent aging
- Pervasive health care and patient monitoring
- New medical diagnostics and treatments
- Ambient assisted living
- Virtual hospitals

#### 3. Communications and Networking

Chaired by Ming Li (Utah State University)

- Various types of BANs, e.g. in-body, on-body and around-body networks
- Signal/information processing and communication models in BANs
- BAN architectures and protocols
- Power-efficient communications
- Wireless energy transfer
- Delay-tolerance, fault-tolerance and reliability in BANs
- Cloud computing and BANs
- Cognitive networks for medical bands

#### 4. Systems and Applications - Ambient Intelligence

Chaired by Qi Zhang (Aarhus University)

- Sensing and actuation in BANs
- Software engineering and systems engineering for BANs
- Modeling, simulations and empirical experiments
- Design and performance issues
- Tools, testbeds and deployment issues
- Wireless-to-bio interface/transduction
- Standardization

In addition to the main track that covers general/mainstream topics, the BodyNets 2015 technical program will feature a series of special tracks.

### CALL FOR SPECIAL TRACKS PAPERS

In addition to the regular track that covers general/mainstream topics, BodyNets 2015 features several special tracks that focus on specific, emerging or underrepresented topics. All special track papers will be peer-reviewed with the same criteria and quality standard used in the regular track. All accepted special



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track papers will be included as conference papers in the proceedings.

#### ST1: Wireless Implantable Antennas (WIAN)

chaired by Yang Hao (Queen Mary College, University of London, UK), Karu Esselle (Macquarie University, Australia)

#### ST2: Human Body Communications (HBCM)

chaired by Yuichi Kado (Kyoto Institute of Technology, Japan)

#### ST3: Privacy, Security and Trust in Body Area Networks (PSTB)

chaired by Shucheng Yu (University of Arkansas at Little Rock, USA)

#### ST4: Antennas and Propagation in Body Area Networks (APBN)

chaired by Dirk Plettemeier (Technische Universität Dresden, Germany), Matti Hämäläinen, (Oulu University, Finland), Jari Linatti (Oulu University, Finland)

#### ST5: Unconventional Intrabody Communication (UNIC)

Please download the Call for Papers [HERE](#)

chaired by Enrico Natalizio (Université de Technologie de Compiègne, France), Tommaso Melodia (Northeastern University, Boston, USA), Laura Galluccio (University of Catania, Italy)

#### ST6: Cloud-assisted Body Area Networks (CBAN)

Please download the Call for Papers [HERE](#)

chaired by Raffaele Gravina (University of Calabria, Italy), Junichi Suzuki (University of Massachusetts, USA)

#### ST7: Sensors and Algorithms for Human Motion Analysis and Classification (SAHM)

Please download the Call for Papers [HERE](#)

chaired by Angelo Maria Sabatini (Scuola Superiore Sant'Anna, Italy), Rezaul Begg (Victoria University, Melbourne, Australia)

#### ST8: Body Area NanoNETworks: Electromagnetic, Materials and Communications (BANN-EMC)

Please download the Call for Papers [HERE](#)

chaired by Valeria Loscri, (INRIA Lille-Nord Europe, France), Anna Maria Vegni (University of Roma Tre, Italy), Ildiko Peter (Politecnico di Torino, Italy), Ladislau Matekovits (Politecnico di Torino, Italy)

More Special Tracks may be available at a later date.

For more information please visit the conference website.

## PAPER SUBMISSION

Authors are invited to submit papers in the following categories:

- Regular papers: Up to 7 pages
- Short papers: Up to 4 pages
- Poster and demo papers: Up to 1 page

Papers must follow the **ACM** conference paper format. ACM Templates are available at:

<http://www.acm.org/sigs/publications/proceedings-templates>

For detailed submission instructions visit:

<http://bodynets.org/2015/show/initial-submission>

All paper submissions will be handled electronically. Papers must be uploaded to

<https://easychair.org/conferences/?conf=bodynets2015>

### Important dates

- Full Paper Submission deadline: 30 June 2015
- Short Papers and Posters deadline: 1 July 2015
- Notification and Registration opens: 31 July 2015
- Camera-ready deadline: 15 August 2015

## PUBLICATION

All accepted paper will be published by **ACM**. The proceedings are submitted for inclusion to the leading indexing services: **DBLP**, **Google Scholar**, **Thomson Scientific ISI Proceedings**, **Elsevier Engineering Index**, **CrossRef**, **Scopus**, as well as ICST's own EU Digital Library (EUDL).

We reserve the right to exclude papers accepted but not presented without prior request and satisfactory explanation from the conference proceedings submitted for archiving and indexing.

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## Proceedings of the 10th EAI International Conference on Body Area Networks

General Chair: [Eryk Dutkiewicz](#) [Macquarie University, Australia](#)

2015 Proceeding

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#### SESSION: **Wearable computing**

[Foot motion measurement for home based rehabilitation using distributed wearable sensor](#)

[Zhelong Wang](#), [Sen Qiu](#)

Pages: 1-6

doi> [10.4108/eai.28-9-2015.2261463](#)

Full text:  [PDF](#)


This paper presents a wearable sensors based foot motion measurement method for rehabilitation applications. Two commercial wearable sensors were adopted with three measurement units fixed on feet. Quaternions were employed to represent three-dimensional ... [expand](#)

[Acu glass: quantifying acupuncture therapy using Google glass](#)

[Haotian Jiang](#), [James Starkman](#), [Chia-Hung Kuo](#), [Ming-Chun Huang](#)

Pages: 7-10

doi> [10.4108/eai.28-9-2015.2261520](#)

Full text:  [PDF](#)


Acupuncture is a therapeutic or preventative therapy through the stimulation on acupoints that located on the body surface across the anatomy to affect the functions of specific organs or soft tissues. During the acupuncture training process, mapping ... [expand](#)

[WISEglass: smart eyeglasses recognising context](#)

[Florian Wahl](#), [Martin Freund](#), [Oliver Amft](#)

Pages: 11-17

doi> [10.4108/eai.28-9-2015.2261470](#)

Full text:  [PDF](#)


We investigated how regular eyeglasses could be extended with multi-modal sensing and processing functions to support context-awareness applications. Our aim was to leverage eyeglasses as a platform for acquiring and processing context information according ... [expand](#)

[Correlations between inertial body sensor measures and clinical measures in multiple sclerosis](#)

[Jiaqi Gong](#), [Matthew M. Engelhard](#), [Myla D. Goldman](#), [John Lach](#)

Pages: 18-24

doi> [10.4108/eai.28-9-2015.2261504](#)

Full text:  [PDF](#)


Gait assessment using inertial body sensors is becoming popular as an outcome measure in multiple sclerosis (MS) research, supplementing clinical observations and patient-reported outcomes with precise, objective measures. Although numerous research ... [expand](#)

[The speckled cellist: classification of cello bowing techniques using the orient specks](#)

[Debadri Mukherjee](#), [D. K. Arvind](#)

Pages: 25-31


doi> [10.4108/eai.28-9-2015.2261477](#)

Full text:  [PDF](#)

Cello bowing techniques are classified by applying supervised machine learning methods to sensor data from two inertial sensors called the Orient specks -- one worn on the playing wrist and the other attached to the frog of the bow. Twelve different ... [expand](#)

[A smart phone based gait monitor system](#)[Dong Qin, Ming-Chun Huang](#)


Pages: 32-38

doi> [10.4108/eai.28-9-2015.2261519](#)Full text:  [PDF](#)

Gait analysis is the study of human locomotion and is able to provide useful information in various areas such as health care, therapy, sports training, and characteristic recognition. This paper presents a smartphone based system to collect and calculate ... [expand](#)

**SESSION: Embedded devices and medical applications**[Ear-lead multiple smart bio sensor system in m-health](#)[Numan Celik, Wamadeva Balachandran, Nadarajah Manivannan](#)


Pages: 39-43

doi> [10.4108/eai.28-9-2015.2261544](#)Full text:  [PDF](#)

In this paper, we present a multi-parameter wearable sensor system in conjunction with a smartphone to enable a real-time unobtrusive monitoring of core body temperature, electrocardiogram (ear-lead ECG), and blood oxygen saturation (SpO2) ... [expand](#)

[Fall-MobileGuard: a smart real-time fall detection system](#)[Giancarlo Fortino, Raffaele Gravina](#)


Pages: 44-50

doi> [10.4108/eai.28-9-2015.2261462](#)Full text:  [PDF](#)

This paper proposes Fall-MobileGuard, a novel real-time non-invasive fall detection and alarm notification system. The proposed system, in particular, is able to recognize different types of falls and is based on a wearable inertial sensor node, equipped ... [expand](#)

[Body-IMU autocalibration for inertial hip and knee joint tracking](#)[Sarvenaz Salehi, Gabriele Bleser, Attila Reiss, Didier Stricker](#)


Pages: 51-57

doi> [10.4108/eai.28-9-2015.2261522](#)Full text:  [PDF](#)

Sensor to body calibration is a key requirement for capturing accurate body movements in applications based on wearable systems. In this paper, we consider the specific problem of estimating the positions of multiple inertial measurement units (IMUs) ... [expand](#)

[Muscle strength testing using wearable wireless sensors](#)[Debadri Mukherjee, D. K. Arvind](#)


Pages: 58-61

doi> [10.4108/eai.28-9-2015.2261461](#)Full text:  [PDF](#)

Manual muscle testing and its variants have a long history of use for classifying muscle strengths. For the first time, inexpensive wearable wireless sensors combined with machine learning techniques are used to classify different levels of muscle strength, ... [expand](#)

[WE-Harvest: a wearable piezoelectric-electromagnetic energy harvester](#)[Rawnak Hamid, Ali Mohammadi, Mehmet Rasit Yuce](#)


Pages: 62-66

doi> [10.4108/eai.28-9-2015.2261451](#)Full text:  [PDF](#)

Wearable electronics require a sustainable electrical power supply to operate. Energy harvesting techniques can be used to convert available nonelectrical energy sources into electrical energy. This paper presents WE-Harvest, a new wearable energy harvesting ... [expand](#)

[Miniaturized implantable DS-PIFA antenna for biomedical applications](#)[Farhad Gozasht, Ananda Sanagavarapu Mohan](#)


Pages: 67-70

doi> [10.4108/eai.28-9-2015.2261517](#)Full text:  [PDF](#)

This paper presents an implantable miniaturized planar inverted-F antenna (PIFA) for biomedical applications. We propose small sized PIFA that can operate over 2.45 GHz Industrial, Scientific, and Medical (ISM) band. We have investigated the effect of ... [expand](#)

[Physical channel modeling by calcium signaling in molecular communication based nanonetwork](#)[Sushovan Das, Soumallya Chatterjee, Biresh Kumar Joardar, Amitava Mukherjee, Mrinal K. Naskar](#)

Pages: 71-77


doi> [10.4108/eai.28-9-2015.2262101](#)Full text:  [PDF](#)

Molecular communication is an emerging field of communication. It allows biological nanomachines to communicate through exchanging molecules in an aqueous environment and to perform collaborative tasks through integrating functionalities of individual ... [expand](#)

**SESSION: Cloud-assisted body area networks (CBAN)**

Personalized neuroscience: user modeling of cognitive function and brain activity in the cloudTeresa A. Nick, Laura M. Berman, Arye Z. Barneham


Pages: 78-84

doi> [10.4108/eai.28-9-2015.2261443](https://doi.org/10.4108/eai.28-9-2015.2261443)Full text:  [PDF](#)

Reliable detection and prediction of neural activity and behavior requires a user model of brain activity that dynamically adapts based on known time-dependent physiological processes, as well as unknown traits of the user. We have applied wireless electroencephalography ... [expand](#)

Using cloud-assisted body area networks to track people physical activity in mobilityGiancarlo Fortino, Raffaele Gravina, Wenfeng Li, Congcong Ma


Pages: 85-91

doi> [10.4108/eai.28-9-2015.2261424](https://doi.org/10.4108/eai.28-9-2015.2261424)Full text:  [PDF](#)

This paper describes a novel BSN-based integrated system for detecting, monitoring, and securely recording human physical activities using wearable sensors, a personal mobile device, and a Cloud-computing infrastructure supported by the BodyCloud platform. ... [expand](#)

Cloud based software defined wireless body area networks architecture for virtual hospitalMd Al Shayokh, Jin Woo Kim, Soo Young Shin


Pages: 92-95

doi> [10.4108/eai.28-9-2015.2261508](https://doi.org/10.4108/eai.28-9-2015.2261508)Full text:  [PDF](#)

Recent developments in wireless communication inflate a new area of research named as Wireless Body Area Networks. WBANs enhance the concept of virtual hospital with the help of cloud computing (CC) technology. Still numerous technical challenges could ... [expand](#)

Mauka-mauka: measuring and predicting opportunities for webcam-based heart rate sensing in workplace environmentMridula Singh, Abhishek Kumar, Kuldeep Yadav, Himanshu Madhu, Tridib Mukherjee


Pages: 96-102

doi> [10.4108/eai.28-9-2015.2261492](https://doi.org/10.4108/eai.28-9-2015.2261492)Full text:  [PDF](#)

Prolonged sitting and physical inactivity at workplace often lead to various health risks such as diabetes, heart attack, cancer etc. Many organizations are investing in wellness programs to ensure the well-being of their employees. Generally wearable ... [expand](#)

Energy efficient duty cycle design based on quantum immune clonal evolutionary algorithm in body area networksJie Zhou, Eryk Dutkiewicz, Ren Ping Liu, Gengfa Fang, Yuanan Liu


Pages: 103-106

doi> [10.4108/eai.28-9-2015.2261427](https://doi.org/10.4108/eai.28-9-2015.2261427)Full text:  [PDF](#)

Duty cycle design is an important topic in body area networks. As small sensors are equipped with the limited power source, the extension of network lifetime is generally achieved by reducing the network energy consumption, for instance through duty ... [expand](#)

**SESSION: Ultra wideband for body area networking (UWBAN)**Robust wideband printed antennas for body-centric communications: the keynote speech of UWBAN-2015Roy B. V. B. Simorangkir, Syed Muzahir Abbas, Karu P. Esselle


Pages: 107-109

doi> [10.4108/eai.28-9-2015.2261523](https://doi.org/10.4108/eai.28-9-2015.2261523)Full text:  [PDF](#)

A wideband printed antenna designed for body-centric communications is presented. Its very wide bandwidth extending from 4 to 9.5 GHz is obtained by applying several bandwidth enhancement techniques on the radiator while keeping a full ground plane intact ... [expand](#)

Energy efficiency evaluation of ECC scheme utilizing decomposable codes in IEEE std 802.15.6 based WBANsKento Takabayashi, Heikki Karvonen, Tuomas Paso, Hirokazu Tanaka, Chika Sugimoto, Ryuji Kohnno


Pages: 110-115

doi> [10.4108/eai.28-9-2015.2261439](https://doi.org/10.4108/eai.28-9-2015.2261439)Full text:  [PDF](#)

Recently, studies on medical and health monitoring systems using wireless communications have been actively conducted. In the field of health monitoring systems, wireless body area network (WBAN) is one of the key technologies and its standardization ... [expand](#)

Performance evaluation of IEEE 802.15.4-2011 IR-UWB system with enhanced modulation schemeTuomas Paso, Ville Niemelä, Jussi Haapola, Matti Hämäläinen, Jari Iinatti

Pages: 116-122

doi> [10.4108/eai.28-9-2015.2261507](https://doi.org/10.4108/eai.28-9-2015.2261507)Full text:  [PDF](#)


In this paper, we propose and analyze an enhanced modulation scheme for impulse radio ultra wideband (IR-UWB) communications based on the IEEE Std. 802.15.4-2011. Currently, the pulse position modulation as utilized in the standard wastes 50% of the ... [expand](#)

Impact of on-body channel models on positioning success rate with UWB wireless body area networks

[Arturo Guizar, Claire Goursaud, Bernard Uguen](#)

Pages: 123-126

doi> [10.4108/eai.28-9-2015.2261545](#)

Full text:  [PDF](#)

In this paper, we aim to evaluate the positioning success rate of nodes placed on the body using different scheduling strategies at the Media Access Control (MAC) layer with Ultra Wide Band (UWB) Wireless Body Area Networks (WBAN) and under three different ... [expand](#)


#### SESSION: **Body area NanoNETworks - electromagnetic, materials and communications (BANN-EMC)**

[Subthreshold energy harvesters circuits for biomedical implants applications](#)

[Meriam Gay Bautista, Eryk Dutkiewicz, Michael Heimlich](#)

Pages: 127-131

doi> [10.4108/eai.28-9-2015.2261402](#)

Full text:  [PDF](#)


This paper reviews the state-of-art of the subthreshold level design energy harvesters for powering biomedical implants. Power consumption and lifespan are crucial requirements for the electronic circuitry of implantable systems. In order to meet these ... [expand](#)

[Design and simulation of a low-actuation-voltage MEMS switch](#)

[Yasser Mafinejad, Abbas Z. Kouzani, Ladislau Matekovits](#)

Pages: 132-138

doi> [10.4108/eai.28-9-2015.2261432](#)

Full text:  [PDF](#)


This paper presents a low-actuation-voltage micro-electro-mechanical system (MEMS) capacitive shunt switch which has a very large bandwidth (4 GHz to 24 GHz). In this work, the isolation of MEMS switch is improved by adding two short high impedance transmission ... [expand](#)

[Design and analysis of a wireless nanosensor network for monitoring human lung cells](#)

[Eisa Zarepour, Najmul Hassan, Mahbub Hassan, Chun Tung Chou, Majid Ebrahimi Warkiani](#)

Pages: 139-145

doi> [10.4108/eai.28-9-2015.2261516](#)

Full text:  [PDF](#)


Thanks to nanotechnology, it is now possible to fabricate sensor nodes below 100 nanometers in size. Although wireless communication at this scale has not been successfully demonstrated yet, simulations confirm that these sensor nodes would be able to ... [expand](#)

[Modeling and experimental analysis of an in-body area nanonetwork](#)

[Valeria Loscri, Ladislau Matekovits, Ildiko Peter, Anna Maria Vegni](#)

Pages: 146-152

doi> [10.4108/eai.28-9-2015.2261435](#)

Full text:  [PDF](#)


Nanotechnology is gaining more and more consensus in several application fields, comprised in-body applications. Innovative therapies and diagnostic approaches are based on the use of injections or oral delivery of nanoparticles. The acceleration of ... [expand](#)

[Bio-compatibility of metallic alloys for body-area communication systems](#)

[Ildiko Peter, Mario Rosso](#)

Pages: 153-158

doi> [10.4108/eai.28-9-2015.2261434](#)

Full text:  [PDF](#)

Mechanical behavior, biocompatibility in body environment and tissues and chemical stability are the most important requirements for the effective application of any bio-implant materials in the human body. Among the known metals and alloys, stainless ... [expand](#)


#### SESSION: **Sensors and algorithms for human motion analysis and classification (SAHM)**

[Gait parameters change prior to freezing in Parkinson's disease: a data-driven study with wearable inertial units](#)

[Maria Laura Ferster, Sinziana Mazilu, Gerhard Tröster](#)

Pages: 159-166

doi> [10.4108/eai.28-9-2015.2261411](#)

Full text:  [PDF](#)


Freezing of gait (FoG) is a motor impairment among patients with advanced Parkinson's disease which is associated with falls and has a negative impact on a patient's quality of life. Wearable systems have been developed to detect FoG and to help patients ... [expand](#)

[A smartphone-centered wearable sensor network for fall risk assessment in the elderly](#)

[Andrea Mannini, Angelo Maria Sabatini](#)

Pages: 167-172

doi> [10.4108/eai.28-9-2015.2261433](#)

Full text:  [PDF](#)


Fall prevention is an important aspect to keep high the quality of life in aging. In this work, a wearable sensor network to automatically assess movement and its indicator for fall risk is proposed. The method is based on a smartphone linked to wearable ... [expand](#)

[Support vector machines for young and older gait classification using inertial sensor kinematics at minimum toe clearance](#)

[Braveena K. Santhiranayagam, Daniel T. H. Lai, Rezaul K. Begg](#)

Pages: 173-178

doi>[10.4108/eai.28-9-2015.2261579](https://doi.org/10.4108/eai.28-9-2015.2261579)

Full text:  [PDF](#)


The present study investigates the inertial sensor kinematics obtained at a critical toe-control event, Minimum Toe Clearance (MTC), to classify different age groups. Fourteen young and fourteen older adults performed treadmill walking at their preferred ... [expand](#)

[Estimating calorie expenditure from output voltage of piezoelectric energy harvester: an experimental feasibility study](#)

[Guohao Lan](#), [Sara Khalifa](#), [Mahbub Hassan](#), [Wen Hu](#)

Pages: 179-185

doi>[10.4108/eai.28-9-2015.2261453](https://doi.org/10.4108/eai.28-9-2015.2261453)

Full text:  [PDF](#)


There is a growing interest in developing energy harvesting solutions for wearable devices so they can self-power themselves without relying on batteries. Piezoelectric energy harvesters (PEHs) can convert kinetic energy released from human activities ... [expand](#)

[mBeacon: accurate, robust proximity detection with smart phones and smart watches using low frequency modulated magnetic fields](#)

[Gerald Pirkl](#), [Peter Hevesi](#), [Jingyuan Cheng](#), [Paul Lukowicz](#)

Pages: 186-191

doi>[10.4108/eai.28-9-2015.2261515](https://doi.org/10.4108/eai.28-9-2015.2261515)

Full text:  [PDF](#)


We describe a proximity detection method that leverages the internal magnetic field sensors in smart phones and smart watches to allow reliable, robust detection of proximity to predefined regions of interest within a 30--50cm radius. For marking the ... [expand](#)

[Simultaneous estimation of WCE moving distance and heading direction based on RSSI-based localization](#)

[Takahiro Ito](#), [Daisuke Anzai](#), [Jiangqing Wang](#)

Pages: 192-195

doi>[10.4108/eai.28-9-2015.2261407](https://doi.org/10.4108/eai.28-9-2015.2261407)

Full text:  [PDF](#)

In this paper, we propose a simultaneous moving distance and heading direction estimation method for wireless capsule endoscope (WCE) system only with RSSI measurement data, which can be obtained as a fundamental function of wireless communications. ... [expand](#)


#### SESSION: Human body communications (HBCM)

[Driver's ECG signal detection and transmission by impulse-radio-based human body communication technology](#)

[Jiangqing Wang](#), [Taku Kato](#), [Daisuke Anzai](#)

Pages: 196-198

doi>[10.4108/eai.28-9-2015.2261526](https://doi.org/10.4108/eai.28-9-2015.2261526)

Full text:  [PDF](#)


In this study, we developed a wearable electrocardiogram (ECG) sensor with human body communication (HBC) technology for vital data transmission in a car. The ECG signals were modulated with wideband pulse signals between 10 and 60 MHz based on an impulse ... [expand](#)

[An empirical measurement of signal attenuation and BER of IEEE 802.15.6 HBC using a phantom solution](#)

[Kim Taylor](#), [Daniel Lai](#)

Pages: 199-205

doi>[10.4108/eai.28-9-2015.2261666](https://doi.org/10.4108/eai.28-9-2015.2261666)

Full text:  [PDF](#)


The implementation of an IEEE 802.15.6 section 10 compliant human body communications (HBC) transceiver requires an understanding of the signal integrity expected at the receiver. This paper focuses on the reception of IEEE 802.15.6 compliant data packets ... [expand](#)

[Maximization of received signal power by impedance matching in human body communication receiver](#)

[Naruto Arai](#), [Dairoku Muramatsu](#), [Ken Sasaki](#)

Pages: 206-209

doi>[10.4108/eai.28-9-2015.2261445](https://doi.org/10.4108/eai.28-9-2015.2261445)

Full text:  [PDF](#)


Human body communication (HBC) utilizes human body as part of the transmission channel. The present paper deals with HBC between a transmitter worn on the user's wrist and an off-body stationary receiver touched by the user's finger. In this configuration, ... [expand](#)

[Signal interference analysis model in near-field coupling communication](#)

[Shin Hasegawa](#), [Ibuki Yokota](#), [Masaki Ishida](#), [Hitoshi Shimasaki](#), [Yuichi Kado](#), [Mitsuru Shinagawa](#)

Pages: 210-215

doi>[10.4108/eai.28-9-2015.2261485](https://doi.org/10.4108/eai.28-9-2015.2261485)

Full text:  [PDF](#)

Near-field coupling communication (NFCC) is a technology that uses the surface of the human body as a transmission path. To suppress the radiation signal from the human body, NFCC devices use a carrier frequency of less than 10 MHz. Because the radiation ... [expand](#)


[Noise measurement via human body for intra-body communication](#)

[Yuki Hayashida](#), [Mari Hasegawa](#), [Akito Suzuki](#), [Mitsuru Shinagawa](#), [Yuichi Kado](#), [Nozomi Haga](#)

Pages: 216-220

doi>[10.4108/eai.28-9-2015.2261611](https://doi.org/10.4108/eai.28-9-2015.2261611)



Full text:  [PDF](#)

Intra-body communication has a serious problem with the noise via the human body. In this system, the noise via the human body is transmitted along the same path as a signal because of capacitance coupling among nodes. These are transmitted in a coordinate ... [expand](#)


#### SESSION: **Communications and networking**

[Low energy clustering in BAN based on fuzzy simulated evolutionary computation](#)

[Jie Zhou](#), [Eryk Dutkiewicz](#), [Ren Ping Liu](#), [Gengfa Fang](#), [Yuanan Liu](#)

Pages: 221-227

doi> [10.4108/eai.28-9-2015.2261426](#)

Full text:  [PDF](#)


A low energy clustering method of body area networks based on fuzzy simulated evolutionary computation is proposed in this paper. To reduce communication energy consumption, we also designed a fuzzy controller to dynamically adjust the crossover and ... [expand](#)

[Transmission policies for energy harvesting sensors based on markov chain energy supply](#)

[Wenxiang Zhu](#), [Pingping Xu](#), [Maozong Zheng](#), [Guilu Wu](#), [Honglei Wang](#)

Pages: 228-232

doi> [10.4108/eai.28-9-2015.2261406](#)

Full text:  [PDF](#)


Due to the small energy harvesting rates and stochastic energy harvesting processes, energy management of energy harvesting sensor is still crucial for body network. Transmission policies for energy harvesting sensors with Markov chain energy supply over ... [expand](#)

[Analysis of indoor rowing motion using wearable inertial sensors](#)

[Stephan Bosch](#), [Muhammad Shoaib](#), [Stephen Geerlings](#), [Lennart Buit](#), [Nirvana Meratnia](#), [Paul Havinga](#)

Pages: 233-239

doi> [10.4108/eai.28-9-2015.2261465](#)

Full text:  [PDF](#)


In this exploratory work the motion of rowers is analyzed while rowing on a rowing machine. This is performed using inertial sensors that measure the orientation at several positions on the body. Using these measurements, this work provides a preliminary ... [expand](#)

[A dual-channel routing protocol for wireless body area networks](#)

[Sobia Omer](#), [Rein Vesilo](#), [Eryk Dutkiewicz](#), [Qi Zhang](#)

Pages: 240-246

doi> [10.4108/eai.28-9-2015.2261430](#)

Full text:  [PDF](#)


Wireless Body Area networks (WBANs) are a subset of wireless sensor networks that interconnect miniaturized nodes with sensor or actuator capabilities in, on, or around a human body. WBANs can operate over a number of different frequency bands such as ... [expand](#)

[Energy harvested IEEE 802.15.4 wireless body area network](#)

[Thien D. Nguyen](#), [Jamil Y. Khan](#), [Duy T. Ngo](#)

Pages: 247-253

doi> [10.4108/eai.28-9-2015.2261429](#)

Full text:  [PDF](#)

With the increasing demand of wireless body area network (WBAN) for patient monitoring systems, it is necessary to develop efficient energy management systems to either prolong node battery replacement time or to develop battery-less WBAN nodes. In this ... [expand](#)


#### SESSION: **Systems and applications - ambient intelligence**

[Towards implantable body sensor networks: performance of MICS band radio communication in animal tissue](#)

[V. R. K. Ramachandran](#), [Kui Zhang](#), [Nirvana Meratnia](#), [Paul J. M. Havinga](#)

Pages: 254-260

doi> [10.4108/eai.28-9-2015.2261413](#)

Full text:  [PDF](#)


Reliable wireless communication inside the human body is crucial for the design of implantable body sensor networks (IBSN). The tissues in human body are heterogeneous and have different conductivity and permittivity, which make the modeling of the wireless ... [expand](#)

[Low-threshold CMOS rectifier design for energy harvesting in biomedical sensors](#)

[Ali Mohammadi](#), [Jean-Michel Redoute](#), [Mehmet R. Yuce](#)

Pages: 261-264

doi> [10.4108/eai.28-9-2015.2261450](#)

Full text:  [PDF](#)


The power transfer efficiency of energy harvesting systems is strongly dependent on the power conditioning circuits, especially rectifiers. The voltage drop across rectifier and its leakage current can drastically influence the efficiency. The hybrid ... [expand](#)

[Frequency modulation based resistive sensing for wearable galvanic skin response](#)

[Md Shamsul Arefin](#), [Jean-Michel Redouté](#), [Mehmet Rasit Yuce](#)

Pages: 265-268

doi> [10.4108/eai.28-9-2015.2261514](#)

Full text:  [PDF](#)


This paper presents a frequency modulation based readout circuit for the measurement of skin conductance or resistance. A charge pump based frequency-to-voltage converter circuit with adjustable sensitivity is used to convert the frequency shifts due ... [expand](#)

[Toward detection and monitoring of gait pathology using inertial sensors under rotation, scale, and offset invariant dynamic time warping](#)

[Matthew M. Engelhard](#), [Sriram Raju Dandu](#), [John C. Lach](#), [Myla D. Goldman](#), [Stephen D. Patek](#)

Pages: 269-275

doi>[10.4108/eai.28-9-2015.2261503](#)

Full text:  [PDF](#)


Walking ability can be degraded by a number of pathologies, including movement disorders, stroke, and injury. Personal activity tracking devices gather inertial data needed to measure walking quality, but the required algorithmic methods are an active ... [expand](#)

[Estimation and tracking of knee angle trajectory using inertial sensors and a smartphone application](#)

[Jaskaran Singh Grover](#), [Venkat Natarajan](#)

Pages: 276-282

doi>[10.4108/eai.28-9-2015.2261468](#)

Full text:  [PDF](#)


We demonstrate a practical solution to track the 2-D knee angle trajectory of a user in real-time using inertial sensors embedded in a wearable knee-band wirelessly coupled with a mobile device, by mathematically modeling the knee as a hinge joint. We ... [expand](#)

[Exploring the dominant-hand effect using a multi-scale SEMG energy model](#)

[Chi-Yu Wu](#), [Ching-Fen Jiang](#), [Nan-Ying Yu](#)

Pages: 283-286

doi>[10.4108/eai.28-9-2015.2262054](#)

Full text:  [PDF](#)

Hand dominance is an important factor in the performance of motor skills. Our previous study proposed a multi-scale SEMG energy model called a MSWEV graph to explore the dominant-hand effect and the associated changes with myofascial pain. However, in ... [expand](#)


**SESSION: Unconventional intrabody communication (UNIC) & privacy, security and trust in body area networks (PSTB)**

[Metallic plasmonic nano-antenna for wireless optical communication in intra-body nanonetworks](#)

[Mona Nafari](#), [Josep Miquel Jornet](#)

Pages: 287-293

doi>[10.4108/eai.28-9-2015.2261410](#)

Full text:  [PDF](#)


Nanonetworks consist of nano-sized communicating devices which are able to perform simple tasks at the nanoscale. Nanonetworks are the enabling technology for unique applications, including intra-body health-monitoring and drug delivery systems. In this ... [expand](#)

[Mobility independent secret key generation for wearable health-care devices](#)

[Girish Revadiqar](#), [Chitra Javali](#), [Hassan Jameel Asghar](#), [Kasper B. Rasmussen](#), [Sanjay Jha](#)

Pages: 294-300

doi>[10.4108/eai.28-9-2015.2261446](#)

Full text:  [PDF](#)


Security in Wireless Body Area Networks (WBAN) is of major concern as the miniature personal health-care devices need to protect the sensitive health information transmitted in wireless medium. It is essential for these devices to generate the shared ... [expand](#)

[Secret key generation by virtual link estimation](#)

[Chitra Javali](#), [Girish Revadiqar](#), [Ming Ding](#), [Sanjay Jha](#)

Pages: 301-307

doi>[10.4108/eai.28-9-2015.2261448](#)

Full text:  [PDF](#)


In recent years, researchers have explored using unique radio propagation characteristics between two devices for extracting symmetric keys. However, the state-of-the-art has the following limitations: (i) paying more attention to only when the two devices ... [expand](#)

[Stretchable and highly conductive carbon nanotube-graphene hybrid yarns for wearable systems](#)

[Syed Muzahir Abbas](#), [Javad Foroughi](#), [Yogesh Ranga](#), [Ladislau Matekovits](#), [Karu P. Esselle](#), [Stuart G. Hay](#), [Michael C. Heimlich](#), [Farzad Safaei](#)

Pages: 308-309

doi>[10.4108/eai.28-9-2015.2261421](#)

Full text:  [PDF](#)

Carbon Nanotubes (CNTs) have emerged as potential candidates for replacement of conventional metals due to their significant mechanical, electrical, thermal properties and non-oxidizing abilities [1, 2]. The density of CNT composites is about five times ... [expand](#)


**POSTER SESSION: Poster**

[Securing the timestamping of sensor data from wearable healthcare devices](#)

[Muhammad Siddiqi](#), [Gerard Hager](#), [Vijay Sivaraman](#), [Sanjay Jha](#)

Pages: 310-310

doi>[10.4108/eai.28-9-2015.2261552](#)

Full text:  [PDF](#)


An ageing population, coupled with increasing prevalence of chronic diseases, is placing unsustainable demands on current healthcare systems. Home-based medical monitoring, supported by wearable sensors for heart-rate, ECG, blood pressure, blood glucose, ... [expand](#)

[Feasibility of a low-cost platform for physiological recording in affective computing applications](#)

[Hamed Monkaresi](#), [Rafael A. Calvo](#)

Pages: 311-311

doi>[10.4108/eai.28-9-2015.2261525](#)

Full text:  [PDF](#)


Physiological signals provide valuable information about human physical and mental states. For decades, sophisticated equipment has been used to measure them in health and psychological applications. More recently a variety of low-cost portable electronic ... [expand](#)

[Diagnosing bipolar disorders in a wearable device](#)

[Chao Gui](#), [Jie Zhu](#)

Pages: 312-312

doi>[10.4108/eai.28-9-2015.2261428](#)

Full text:  [PDF](#)


Bipolar disorder, also known as a manic-depressive illness, is a common chronic recurrent psychosis and it mainly relies on doctors' experience to determine the patient's condition currently. Internationally, the doctor or mental health professional ... [expand](#)

[Multilayered phantom for input impedance evaluation of human body communication electrodes](#)

[Dairoku Muramatsu](#), [Fukuro Koshiji](#), [Kohji Koshiji](#), [Ken Sasaki](#)

Pages: 313-313

doi>[10.4108/eai.28-9-2015.2261486](#)

Full text:  [PDF](#)


This paper presents the input impedance measurement of a human body communication electrode by using newly developed multilayered phantom. Based on the comparison between analysis and measurement values, it was found that the multilayered phantom can ... [expand](#)

[Posture sensor: cross leg detector at knee level](#)

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