

**Sixth International Conference on  
Intelligent Sensors, Sensor Networks and Information Processing  
ISSNIP 2010**

*December 7-10, 2010*

*Queensland University of Technology, Brisbane, Australia*

**Advance Program**

Tuesday 7 December 2010		
8:00am-5:00pm	Registrations	
9:00-10:30am	<b>Tutorial 1</b> End-to-end reliability of sensor networks Prof. Rachel Cardell-Oliver, The University of Western Australia	<b>Tutorial 2a</b> Using heart rate variability (HRV) as a diagnostic tool Dr. Herbert Jelinek, Charles Sturt University
10:30-11:00am	Morning Tea	
11:00-12:30pm	<b>Tutorial 1 Continued</b>	<b>Tutorial 2b</b> Sports Engineering with Wearable Sensors Dr. Daniel James, Griffiths University
12:30-1:30pm	Lunch	
1:30-3:00pm	<b>Tutorial 3</b> Cloud Computing and Sensor Networks Prof. Rajkumar Buyya, University of Melbourne	<b>Tutorial 4</b> Body Area Networks Dr. Leif Hanlen, NICTA
3:00-3:30pm	Morning Tea	
3:30-5:00pm	<b>Tutorial 3 Continued</b>	<b>Tutorial 4 Continued</b>

Wednesday 8 December 2010			
8:00am-5:00pm	Registrations		
9:00-9:30am	Conference Opening		
9:30-10:30am	<b>ISSNIP - e-Science Joint Opening Keynote Talk</b> Prof. Thom Dunning		<b>Secure and trustworthy sensor networking workshop</b>
10:30-11:00am	Morning Tea		
11:00-12:30pm	1A - Advances in Optimization (4 Papers)	1B - Sensor Networks (4 Papers)	<b>Secure and trustworthy sensor networking workshop</b>
12:30-1:30pm	Lunch		
1:30-2:10pm	<b>Keynote Talk 1</b> A decade of Wireless Sensor Network research - Are we there yet? Prof. Sanjay Jha		<b>Secure and trustworthy sensor networking workshop</b>
2:10-3:10pm	2A - Sensor Networks in Healthcare (3 Papers)	2B - Sensor Networks (3 Papers)	<b>Secure and trustworthy sensor networking workshop</b>
3:10-3:30pm	Afternoon Tea		
3:30-4:10pm	<b>Keynote Talk 2</b> Estimation of Dynamical Systems via Wireless Sensor Networks: Resource Allocation and Performance Optimization Prof. Subrakanthi Dey		<b>Secure and trustworthy sensor networking workshop</b>
4:15-5:15pm	3A - Advances in Optimization (3 papers)	3B - Sensor Networks (3 Papers)	3C - Sensor Networks Security (2 papers)

Thursday 9 December 2010			
8:30-5:00pm	Registrations		
8:25-9:45am	4A - Advances in Optimization (4 Papers)	4B - Sensor Networks (3 Papers)	Workshop on Smart Cities
9:45-10:25am	<b>Keynote Talk 3</b> <b>Mobile phones as tools for diagnosis and medical management in remote and under-served communities</b> <b>A/Prof. Jim Black</b>		
10:25-10:45am	Morning Tea		
10:45-11:25am	<b>Keynote Talk 4 - Prof. Paul Havinga</b>		Workshop on Smart Cities
11:30-12:10am	<b>Keynote Talk 5</b> <b>Prof. Radha Poovendran</b>		
12:15-1:15pm	Lunch		
1:15-1:55pm	<b>Keynote Talk 6</b> <b>New techniques to extract a fetal electrocardiogram from multi-electrodes on the maternal abdominal wall</b> <b>Prof. Yoshitaka Kimura</b>		Workshop on Smart Cities
2:00-3:00pm	5A - Sensor Networks in Healthcare (3 Papers)	5B - Sensor Networks (3 Papers)	
3:00-3:30pm	Afternoon Tea		
3:30-4:10pm	<b>Keynote Talk 7</b> <b>Prof. Ian Peterson</b>		Workshop on Smart Cities
4:15-5:35pm	6A - Sensor Networks Security (3 Papers)	6B - Sensor Networks (4 Papers)	
6:30-10:30pm	Conference Dinner		

Friday 10 December 2010			
8:30-9:30am	7A - Sensor Networks in Healthcare (3 Papers)	7B - Sensor Networks (3 Papers)	ISSNIP/CREON Workshop
9:35-10:15am	<b>Keynote Talk 8</b> <b>5 years of environmental wireless sensing</b> <b>Prof. Peter Corke</b>		
10:15-10:45am	Morning Tea		
10:45-12:15pm	8A - Advances in Optimization (3 Papers)	8B - Sensor Networks (4 Papers)	ISSNIP/CREON Workshop
12:15-1:00pm	Lunch		
1:00-2:00pm	<b>ISSNIP - e-Science Joint Closing Keynote Talk</b> <b>Towards the Virtualisation of Science (TBC)</b> <b>Prof. S. George Djorgovski</b>		ISSNIP/CREON Workshop
2:00pm	Conference Closing		

## 8.30 am-5:00 pm: Registration

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9.00am-10.30am

11am-12:30 am

**Session name: Tutorial 1: End-to-end reliability of sensor networks**

**Speaker: Prof. Rachel Cardell-Oliver**

### **End-to-End Reliability of Wireless Sensor Networks for Environmental Monitoring**

Wireless sensor networks are used to monitor complex real-world landscapes at a fine-grain temporal and spatial resolution. They provide this service as a data-processing pipeline starting from sensors monitoring a phenomenon of interest, through micro-controller hardware and software, radio communication, data pre-processing, data storage, and finally providing data analysis and visualization to end-users. In order to achieve end-to-end reliability each task in the pipeline must provide a reliable service.

This tutorial will offer an overview of the sensor network data-processing pipeline using examples of sensor networks for monitoring soil moisture in natural bush land, micro-climate in tall trees, and irrigation in vineyards. Two of the most difficult challenges for researchers designing and deploying sensor networks are: 1. how to maximize the reliability of data transport whilst minimizing the cost, and 2. how to ensure the quality of data delivered to the end-user. Despite a decade of research in these areas, they continue to provide challenges in real-world applications. The tutorial will review current techniques for addressing the problems of reliable data transport and data quality and will provide some hands-on exercises in the application of those techniques.

**Bio:** Rachel Cardell-Oliver is a Professor in the School of Computer Science and Software Engineering at the University of Western Australia. She has a PhD in protocol verification from the University of Cambridge, UK, and a Masters on distributed systems from UWA. Her research interests include designing and building wireless sensor networks, low-power long-distance radio communication, sensor network query languages and protocols, formal methods for distributed systems, software engineering, software testing and computer science education. The research on end-to-end reliability presented in this tutorial is in collaboration with Professor Christof Huebner at the Mannheim University of Applied Sciences, supported by the Australia–Germany Joint Research Co-operation Scheme.

9.00am-10.30am

**Session name: Tutorial 2a: Using heart rate variability (HRV) as a diagnostic tool**

**Speaker: Dr. Herbert Jelinek**

This tutorial will briefly describe various methods of determining heart rate variability and cardiac autonomic neuropathy. Heart rate variability primarily reflects the input from the autonomic nervous system. Changes in HRV are associated with many diseases such as diabetes, Parkinson's and it is therefore a good measure for identification of anomalies associated with these diseases. Examples of the use of HRV will be provided from eating disorders, depression, and diabetes. The influence of age and gender will also be discussed.

**Bio:** Herbert Jelinek is currently teaching Neuroscience and Pharmacology, at Charles Sturt University, Australia. His main research interest is the use of pattern analysis in clinical assessment of disease processes. As such diverse image analysis tools have been applied to the investigation of changes in blood vessel patterns of people with dementia and schizophrenia as well as changes associated with diabetic retinopathy progression. Single cell analysis of microglia and temporal analysis of ECG series has also been investigated for sensitivity and specificity of disease classification. His main project deals with diabetes and its complications. Within this project he is investigating biochemical markers as risk indicators of disease progression, nonlinear analysis of heart rate intervals in identification of cardiac autonomic neuropathy and developing new methods to identify peripheral vascular disease. Programmes that allow automated identification of diabetic eye disease are also being developed. The emphasis of this work is to develop tools for rural and remote primary health care providers that allow them to determine the presence of disease and the necessity for referral as well as target larger sections of the population.

**11am-12:30 am**

**Session name: Tutorial 2b: Sports Engineering with Wearable Sensors**

**Speaker: Dr. Daniel James**

Technology continues to transform many aspects of our lives. The adoption and use of technology sport is no exception where advances in materials, equipment design, clothing and portable electronics have all had an impact on sport. Miniature sensors are finding their way into a plethora of applications including professional sport. While professional sport might drive some higher-end applications the main take up of sensor technology comes through the consumer market. For example the use of accelerometers to detect the orientation of the iPod and iPhone is one example of a simple but effective use of miniature accelerometers in a consumer device. The range of sports where miniature sensors have been used is extensive, accelerometers have been used in half-pipe snowboarding to detect air time, in rowing to monitor athlete biomechanics and boat movement through the water, in running to generate force-plate simulations, contact time, step rate and other biomechanical information, in football to estimate energy expenditure, in swimming to count laps, monitor lap times and stroke rate. The list is long and growing. For any sport, the question is, what can these sensors do for me?

This talk introduces the field of sports engineering with a particular focus on performance monitoring of athletes using wearable sensors. It would draw on recent progress under taken at Griffith University with several elite sporting bodies (AIS, OWIA, QAS, ICC, CA, Lions) to demonstrate the use of sensors to assist athletes in swimming, rowing, field sports, winter sports, combative sports and cricket

**Bio:** Dr. Daniel James heads the Sports Programme with the Centre for Wireless Monitoring and Applications, Griffith University, Australia, and holds a joint appointment the Centre of Excellence for Applied Sport Science, Queensland Academy of Sport where he leads the technology in sport programme. He holds several international patents on sports technology and devices in daily use by athletes; he continues to develop innovative technologies for Australia's leading sporting organisations. More information can be found on <http://sportsbioengineering.com>

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**10.30am- 11.00am: Coffee Break**

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**12.30pm-1.30pm: Lunch**

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**1.30pm-3.00pm**

**3.30pm-5.00pm**

**Session name: Tutorial 3: Cloud Computing and Sensor Networks**

**Speaker: Prof. Rajkumar Buyya**

**Bio:** Dr. Rajkumar Buyya is Professor of Computer Science and Software Engineering; and Director of the Cloud Computing and Distributed Systems (CLOUDS) Laboratory at the University of Melbourne, Australia. He is also serving as the founding CEO of Manjrasoft Pty Ltd., a spin-off company of the University, commercialising its innovations in Grid and Cloud Computing. He received B.E and M.E in Computer Science and Engineering from Mysore and Bangalore Universities in 1992 and 1995 respectively; and Doctor of Philosophy (PhD) in Computer Science and Software Engineering from Monash University, Melbourne, Australia in 2002. He was awarded Dharma Ratnakara Memorial Trust Gold Medal in 1992 for his academic excellence at the University of Mysore, India. He received Richard Merwin Award from the IEEE Computer Society (USA) for excellence in academic achievement and professional efforts in 1999. He received Leadership and Service Excellence Awards from the IEEE/ACM International Conference on High Performance Computing in 2000 and 2003. He received "Research Excellence Awards" from the University of Melbourne for productive and quality research in computer science and software engineering in 2005 and 2008. He is one of the highly cited authors in computer science and software engineering worldwide (h-index=49, g-index=106, 13000+ citations). The Journal of Information and Software Technology in Jan 2007 issue, based on an analysis of ISI citations, ranked Dr. Buyya's work (published in Software: Practice and Experience Journal in 2002) as one among the "Top 20 cited Software Engineering Articles in 1986-2005". He received the Chris Wallace Award for Outstanding Research Contribution 2008 from the Computing Research and Education Association of Australasia, CORE, which is an association of university departments of computer science in Australia and New Zealand. Dr. Buyya recently received the "2009 IEEE Medal for Excellence in Scalable Computing" for pioneering the economic paradigm for utility-oriented distributed computing platforms such as Grids and Clouds.

**1.30pm-3.00pm**

**3.30pm-5.00pm**

**Session name: Tutorial 4: Body Area Networks**

**Speaker: Dr. Leif Hanlen**

Wireless Body-area-networks (BAN's) represent the humanization of the internet of things – moving wireless sensor networks onto and even inside the human body. Applications of BAN's touch every aspect of health, fitness, occupational and everyday living, and include critical care, elite/amateur sports, military personnel and consumer entertainment. The global shipment for wireless body sensors is expected grow from 11 million units in 2009 to 420 million units in 2014. With the promise of such networks to improve human monitoring, comes the challenge of making unobtrusive and reliable ambient wireless systems.

The aim of this tutorial is to provide a context of emerging wireless standardization efforts (in particular 802.15.4c/802.15.6, Continua and Wibree), and research challenges which impact on body-area-networking. We will outline the requirements and motivation of BAN's based on several real-world scenarios. We will show interaction between application layers and wireless protocols and radio schemes required to service them. The audience will be exposed to physical layer wireless technologies and “myth-busters” style highlights into the counter-intuitive aspects of BAN's which differentiate them from typical wireless sensor networks. This tutorial will give, engineers, and researchers a broad understanding of a BAN system; and the challenges and opportunities presented in research, development, integration and commercialization. A comprehensive introduction will be combined with in-depth discussion of important BAN communications techniques, and potential system design techniques. No previous experience in wireless sensor networks is required.

**Bio:** Dr Leif Hanlen is a member of the Human Performance Improvement Project at NICTA, and is the project leader. They have been carrying out extensive research in Wireless Body-Area-Networks (BAN) communications in the physical layer as part of this project; in conjunction with related research in the MAC and applications layer. They have made 12 separate contributions to the IEEE 802.15.6 standards task group. The project team has 22 peer-reviewed publications, and a number of provisional patent applications, of which Dr. Hanlen is a significant contributor. One of his conference publications received best paper award (Communications): D. Smith, L. Hanlen, D. Miniutti, J. Zhang, D. Rodda, B. Gilbert “Statistical characterization of the dynamic narrowband body-area channel”, First International Symposium on Applied Sciences on Biomedical and Communication Technologies, 2008. ISABEL '08, Aalborg, Denmark. The project team has developed various hardware, and undertaken extensive measurement campaigns, which have been used to accurately characterize, and simulate, body-area communications over a range of microwave frequencies.

Dr. Hanlen also has extensive experience in channel and space-time coding, MIMO radio communications, physical layer channel modeling, information theory with over 80 peer reviewed research achievements and publications in these fields. Dr. Hanlen has delivered several undergraduate and post-graduate courses in the areas of communication and information theory.

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**3.00pm- 3.30pm: Coffee Break**

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**5.00pm: Program Closes**

# 8<sup>th</sup> December, 2010 – Wednesday

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## **8.00 am-5.00pm: Registration**

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**9.00am-9.30am**

**Session name: ISSNIP 2010 and e-Science 2010 Joint Opening**

**9.30am-10.30am**

**Session name: ISSNIP – e-Science Joint Keynote Talk**

**Speaker: Prof. Thom Dunning**, Director, National Centre for Supercomputing Applications (NCSA)

### **Blue Waters: An Extraordinary Computer to Enable Extraordinary Research**

<http://www.ncsa.illinois.edu/BlueWaters/>

Thom Dunning is the director of the Institute for Advanced Computing Applications and Technologies and the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign. He also holds an endowed position as Distinguished Chair for Research Excellence in Chemistry and professor in the Department of Chemistry.

As leader of IACAT/NCSA, Dunning leads a staff of approximately 300 technologists and scientists who:

- provide and support high-performance computing, data-intensive computing, and networking resources;
- explore innovative computing architectures and techniques to achieve petascale (and beyond) science;
- develop cyberenvironments tailored to the needs of research communities and software and tools to improve cybersecurity;
- create artful visualizations of scientific phenomena;
- and help prepare the next generation of scientists and engineers.

Dunning previously held leadership positions at the Joint Institute for Computational Sciences at the University of Tennessee and Oak Ridge National Laboratory, the University of North Carolina System, the Office of Science at the U.S. Department of Energy, the Environmental Molecular Sciences Laboratory at Pacific Northwest National Laboratory, Argonne National Laboratory, and Los Alamos National Laboratory. He was instrumental in creating DOE's Scientific Discovery through Advanced Computing (SciDAC) program, the federal government's first comprehensive program aimed at developing the software infrastructure needed for leadership-class scientific computing.

He is a fellow of the American Physical Society and of the American Association for the Advancement of Science as well as a member of the American Chemical Society. Dunning received DOE's E. O. Lawrence Award in 1997 and its Distinguished Associate Award in 2001.

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## **10.30am- 11.00am: Coffee Break**

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## Parallel Session 1

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**Session Name: 1A - Advances in Optimization (Learning and Control for Sensor Network Applications)**

**Session Chair: Jason Williams, DSTO, Australia**

*11.00am-11.20am*

**Convergence of Loopy Belief Propagation for Data Association**

Jason L. Williams, Roslyn A. Lau

*11.20am-11.40am*

**Distributed Training of Multiclass Conic-Segmentation Support Vector Machines on Communication Constrained Networks**

Sutharshan Rajasegarar, Alistair Shilton, Christopher Leckie, Ramamohanarao Kotagiri, Marimuthu Palaniswami

*11.40am-12.00pm*

**A Model for Optimal and Robust Control with Time-Varying Computing Constraints**

Adrian N. Bishop, Iman Shames

*12.00pm-12.20pm*

**Establishing a Link Between Multiple-Sensor Outputs and Non-Deterministic Decision-Making**

Edwin El-Mahassni

**Session Name: 1B - Sensor Networks (In-Network Processing and Adaptive Operations)**

**Session Chair: Rachel Cardell Oliver, University of Western Australia, Australia**

*11.00am-11.20am*

**Segment-Based Packet Combining in a Cluster: To Combine or Not to Combine?**

Andreas Willig, Danil Kipnis, Holger Karl

*11.20am-11.40am*

**Reward and Punishment Based Cooperative Adaptive Sampling in Wireless Sensor Networks**

Alireza Masoum, Nirvana Meratnia, Zahra Taghikhaki, Paul J.M. Havinga

*11.40am-12.00pm*

**Minimizing the Operational Cost of Chemical Sensor Networks**

Shanika Karunasekera, Alex Skvortsov, Ajith Gunatilaka

*12.00pm-12.20pm*

**Reducing the Data Transmission in Wireless Sensor Networks Using the Principal Component Analysis**

Amirmohammad Rooshenas, Hamid R. Rabiee, Ali Movaghar, M. Yousof Naderi

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### 12.30pm-1.30pm: Lunch

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**1.30pm-2.10pm**

**Session name: Key Note 1**

**Speaker: Prof. Sanjay Jha**

**A decade of Wireless Sensor Network research - Are we there yet?**

**Bio:** Sanjay K. Jha is a Professor and Head of the Network Group at the School of Computer Science and Engineering at the University of New South Wales. This group founded by Sanjay in July 1999, has become a leading network research group and consists of 4 academic staff members, several postdoctoral fellows and over 20 PhD and Masters by Research students. Prof. Jha holds a Ph.D. degree from the University of Technology, Sydney, Australia. His research activities cover a wide range of topics in networking including Wireless Sensor Networks, Adhoc/Community wireless networks, Resilience and Multicasting in IP Networks and Security protocols for wired/wireless networks. Sanjay has published over 140 articles in high quality journals and conferences. He is the principal author of the book Engineering Internet QoS and a co-editor of the book Wireless Sensor Networks: A Systems Perspective. He has been very active in attracting research grants from ARC, industry and other funding agencies.

## Parallel Session 2

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**Session Name: 2A - Sensor Networks in Healthcare (Body area networks in Healthcare)**  
**Session Chair: Slaven Marusic, University of Melbourne, Australia**

*2.10pm-2.30pm*

**CommonSens: Personalisation of Complex Event Processing in Automated Homecare**  
Jarle Soberg, Vera Goebel, Thomas Plagemann

*2.30pm-3.50pm*

**Using Smart Phones and Body Sensors to Deliver Pervasive Mobile Personal Healthcare**  
Patrick Crilly, Vallipuram Muthukkumarasamy

*2.50pm-3.10pm*

**Availability Measure Model for Assistive Care Loop Framework Using Wireless Sensor Networks**  
Venki Balasubramanian, Doan B. Hoang

**Session Name: 2B - Sensor Networks (Coverage and Localisation)**

**Session Chair: Mukaddim Pathan, CSIRO, Australia**

*2.10pm-2.30pm*

**Using Adaptive Sensor Ranking to Reduce the Overhead of the Coverage Configuration Protocol**  
Silvia Santini

*2.30pm-3.50pm*

**COM-LOC++: A Distributed Range-Free Localization Algorithm in Wireless Networks**  
B.J. Dil, Paul J.M. Havinga

*2.50pm-3.10pm*

**A Practical Localization Solution for Wireless Sensor Networks Deployed in Linear Topography**  
Kui Zhang, Peng Guo, Nirvana Meratnia, Paul J.M. Havinga

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### 3.10pm-3.30pm: Coffee Break

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**3.30pm-4.10pm**

**Session name: Key Note 2**

**Speaker: Prof. Subrakanthi Dey**

**Estimation of Dynamical Systems via Wireless Sensor Networks: Resource Allocation and Performance Optimization**

**Bio:** Subrakanthi Dey (M'96) was born in Calcutta, India, in 1968. He received the B.Tech. and M.Tech. degrees from the Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur, India, in 1991 and 1993, respectively, and the Ph.D. degree from the Department of Systems Engineering, Research School of Information Sciences and Engineering, Australian National University, Canberra, Australia, in 1996.

He has been with the Department of Electrical and Electronic Engineering, University of Melbourne, Parkville, Australia, since February 2000, where he is currently a full Professor. From September 1995 to September 1997 and September 1998 to February 2000, he was a postdoctoral Research Fellow with the Department of Systems Engineering, Australian National University. From September 1997 to September 1998, he was a post-doctoral Research Associate with the Institute for Systems Research, University of Maryland, College Park. His current research interests include networked control systems, wireless communications and networks, signal processing for sensor networks, and stochastic and adaptive estimation and control.

Dr. Dey currently serves on the Editorial Board of the IEEE Transactions on Signal Processing and Elsevier Systems and Control Letters. He was also an Associate Editor for the IEEE Transactions on Automatic Control during 2005-2007. He is a Senior Member of IEEE.

### Parallel Session 3

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**Session Name: 3A - Advances in Optimization (Sensor Network Design Problems)**

**Session Chair: Ian Atkinson, James Cook University, Australia**

*4.15pm-4.35pm*

**Real Time Data Streaming in Sensor Networks: Integrating SAL with the RBNB Data Turbine**

Yong Jin Lee, Jarrod Trevathan, Ian Atkinson, Wayne Read, Nigel Bajema, Adam Scarr, Jochen Braun, Andreas Knisch, Andreas Seemann, Ron Johnstone

*4.35pm-4.55pm*

**DeftRFID: A Lightweight and Distributed RFID Middleware**

Yingliang Lu, Weifeng Zhang, Zengchang Qin, Yao Meng, Hao Yu

*4.55pm-5.15pm*

**An Efficient Distributed Cluster-Head Election Technique for Load Balancing in Wireless Sensor Networks**

Sepideh Afkhami Goli, Hamed Yousefi, Ali Movaghar

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**Session Name: 3B - Sensor Networks (Hardware)**

**Session Chair: Silvia Santini, ETH Zurich, Switzerland**

*4.15pm-4.35pm*

**Developing Low-Cost Intelligent Wireless Sensor Networks for Aquatic Environments**

Jarrold Trevathan, Ian Atkinson, Wayne Read, Nigel Bajema, Yong Jin Lee, Adam Scarr, Ron Johnstone

*4.35pm-4.55pm*

**Low Cost Prototyping System for Sensor Networks**

Neil W. Bergmann, Matthew Wallace, Edoardo Calia

*4.55pm-5.15pm*

**Low Power Wake-Up Receiver for Wireless Sensor Nodes**

Gerd Ulrich Gamm, Matthias Sippel, Milos Kostic, Leonhard M. Reindl

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**Session Name: 3C - Sensor Networks Security**

**Session Chair: Yee Wei Law, University of Melbourne, Australia**

*4.15pm-4.35pm*

**All Proxy Scheme for Event Source Anonymity in Wireless Sensor Networks**

Yihua Zhang, Matthew Price, Lukasz Opyrchal, Keith Frikken

*4.35pm-4.55pm*

**Labelled Data Collection for Anomaly Detection in Wireless Sensor Networks**

Shan Suthaharan, Mohammed Alzahrani, Sutharshan Rajasegarar, Christopher Leckie, Marimuthu Palaniswami

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**5.15pm: Program Closes**

# 9<sup>th</sup> December, 2010 – Thursday

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**8.00 am-5.00pm: Registration**

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## Parallel Session 4

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**Session Name: 4A - Advances in Optimization (Formation and Cooperative Control)**  
**Session Chair: Peter Sarunic , DSTO, Australia**

*8.25am-8.45am*

**A Novel Flocking Inspired Algorithm for Self-Organization and Control in Heterogeneous Wireless Networks**

Haijun Zhang, Jaime Llorca, Christopher C. Davis, Stuart D. Milner

*8.45am-9.05am*

**Cohesive Motion Control of Autonomous Formations in Three Dimensions**

Ismail Bayezit, Mehdi M. Amini, Baris Fidan, Iman Shames

*9.05am-9.25am*

**Reducing Sensors' Movement Using Simple Iterative Virtual Movement**

Hosna Omidvar Mohammadi, Mahmood Fathy, Hossein Ghaffarian

*9.25am-9.45am*

**Trajectory Control of Autonomous Fixed-Wing Aircraft Performing Multiple Target Passive Detection and Tracking**

Peter W. Sarunic, Robin J. Evans

**Session Name: 4B - Sensor Networks (Performance Analysis)**

**Session Chair: Sameer Tilak, University of California, San Diego, USA (TBC)**

*8.30am-8.50am*

**Performance Analysis of IEEE 802.15.4 MAC Protocol for WSNs with ACK Frame Transmission Under Unsaturated Traffic Conditions**

Sumudu Wijetunge, Upul Gunawardana, Ranjith Liyanapathirana

*8.50am-9:10am*

**Performance Evaluation of a Converge-Cast Protocol for IEEE 802.15.4 Tree-Based Networks**

X. Liu, Christopher Leckie, S.K. Saleem

*9.10am-9.30am*

**Comparative Study of RPL-Enabled Optimized Broadcast in Wireless Sensor Networks**

Thomas Clausen, Ulrich Herberg

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**9.45am-10.25am**

**Session name: Key Note 3**

**Speaker: A/Prof. Jim Black**

### **Mobile phones as tools for diagnosis and medical management in remote and under-served communities**

Mobile phones are so useful that even people on very low incomes in developing countries are prepared to spend money acquiring and using them. Wherever mobile phone coverage exists a large proportion of the adult population have already bought mobile phones. This means that, even in remote and underserved rural areas, many health workers in developing countries own mobile phones and carry them with them during their working day. All but the simplest mobile phones now have operating systems, and some have very sophisticated and powerful processors. It is possible to write applications that will run on a wide range of mobile phones. Bringing these two trends together, we have developed a range of mobile phone applications and low-cost diagnostic devices that will run on mobile phones and make them into useful devices to support health workers in their day-to-day work.

**Bio:** Dr Jim Black is Associate Professor in the Nossal Institute for Global Health at the University of Melbourne. He is a medical graduate with postgraduate qualifications in tropical medicine, epidemiology and public health, and spent 10 years of his early career as a clinician, epidemiologist and researcher in southern Africa – mostly in Mozambique. His research interests are centred around the sub-district health facilities of developing countries, and include the potential of mobile phones as diagnostic and patient management tools in the under resourced and remote settings.

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## **10.25am- 10.45am: Coffee Break**

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**10.45am-11.25am**

**Session name: Key Note 4**

**Speaker: Prof. Paul Havinga**

**Bio:** Paul J.M. Havinga is professor in the Computer Science department at the University of Twente in the Netherlands, and CTO of Ambient Systems B.V., in Enschede, the Netherlands. His research interests are in the area of large-scale, heterogeneous wireless systems, sensor networks, energy-efficient architectures and protocols, ubiquitous computing, and wireless communication networks. Research questions cover architectures, protocols, programming paradigms, algorithms, and applications. This research has resulted in over 200 scientific publications in journals and conferences. He has a significant experience as project manager in several international research projects on wireless sensor networks and ubiquitous computing. In 2001 he initiated the first European project on wireless sensor networks (2001 - 2004). In 2004 he founded the company Ambient Systems B.V., partly based on the results of that project. In May 2007 he received the "ICT Innovation Award" for the successful transfer of knowledge from university to industrial use. In June 2007 he received the "van den Kroonenberg award" for being a successful innovative entrepreneur.

**11.30am-12.10am**

**Session name: Key Note 5**

**Speaker: Prof. Radha Poovendran**

**Bio:** Professor Radha Poovendran has been with the Department of Electrical Engineering at the University of Washington (UW), Seattle since 2000. At the UW EE, Professor Poovendran is the Founding Director of the Network Security Lab (NSL). He is also a founding member and the Associate Director for Research at the UW Center for Information Assurance and Cybersecurity. This academic center is a collaborative effort at the UW and includes multiple disciplines and departments, including EE, across the UW campuses. The center is also certified as a "National Center of Excellence in Information Assurance Education" by National Security Agency (NSA).

His doctoral dissertation work was on cryptographic key management for secure multicast communications. His contributions to the wireless security includes, energy-efficient group keying, introducing cross-layer approach in security, secure location estimation in sensor networks, modeling and characterization of wormholes, privacy in medical as well as vehicular ad hoc networks. He is a recipient of the NSF Career Award (2001), ARO YIP Award (2002), and ONR YIP Award (2004), and PECASE Award (2005) for his research contributions in the areas of wired and wireless security. He has served as a guest editor of the IEEE Journal of Selected Areas in Communications (Special issue on Wireless Security 2006), technical program co-chair of the ACM Wireless Security Workshop (WiSe) for two consecutive years 2005-2006, and local chair for IEEE International Symposium on Information Theory (ISIT) 2006. He was a technical program co-chair of the first ACM Conference on Wireless Network Security (WiSec) and the National Workshop on High Confidence Transportation Cyber-Physical Systems in 2008.

His work is funded by NSF, DoD and Industry.

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## **12.15pm-1.15pm: Lunch**

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**1.15pm-1.55pm**

**Session name: Key Note 6**

**Speaker: Prof. Yoshitaka Kimura**

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**New techniques to extract a fetal electrocardiogram from multi-electrodes on the maternal abdominal wall**

Fetal electrocardiogram (ECG) is an ideal method to detect an abnormal fetal electro-cardio-activity such as fetal arrhythmia and fetal compromise. However, extracting fetal ECG non-invasively from abdominal ECG in the clinical situations still remain a major challenge. The challenge is to extract a non-linear, non-stationary 3-D signal from very noisy complex-mixed signals under the condition of SNR less than 1. Recently, we have successfully been able to extract fetal ECG from maternal abdominal wall. Applications of Blind source separation with ultrasound signal as reference (BSSR) and Fast Nonlinear state space projection (FNSSP) to extract fetal ECG will be presented. Results of several clinical applications of the newly developed system at Tohoku University Hospital in Japan will also be presented.

**Bio:** Dr Kimura is a Professor of Obstetrics in the graduate school of medicine at Tohoku University, Japan. He is leading a large interdisciplinary research team in the areas of fetal medicine and biomedical engineering at Tohoku University. He is one of the pioneers in the application of nonlinear signal processing techniques to investigate fetal cardiac abnormalities and to extract fetal ECG from 12 lead Maternal abdominal ECG signals which is currently being deployed at Tohoku University Hospital's Obstetrics department. He has had over 20 years experience in detection, processing, and interpretation of fetal electrocardiogram for the clinical diagnosis and his interests concern combination of the information theory with the infinite dimensional geometry to analyze the nonlinear and nonstationary signals. Currently he is the director of academy of fetal ECG at Tohoku University in Japan. Professor Kimura successfully completed several industry sponsored projects in Japan. He holds 7 patents in the area of fetal surveillance.

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**Parallel Session 5**

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**Session Name: 5A - Sensor Networks in Healthcare (Sensors for monitoring human movement)**  
**Session Chair: Daniel lai/ Daniel James**

*2.00pm-2.20pm*

**Accelerometers: An Underutilized Resource in Sports Monitoring**

Jonathon Neville, Andrew Wixted, David Rowlands, Daniel James

*2.20pm-2.40pm*

**Correlations Between End Point Foot Trajectories and Inertial Sensor Data**

Braveena K. Santhiranayagam, Daniel T.H. Lai, Rezaul K. Begg, Marimuthu Palaniswami

*2.40pm-3.00pm*

**Intelligent Health Care --- A Motion Analysis System for Health Practitioners**

Zenon Chaczko, Anup Kale, Christopher Chiu

**Session Name: 5B - Sensor Networks (Applications)**  
**Session Chair: Bela Stantic, Griffith University, Australia (TBC)**

*2.00pm-2.20pm*

**Induction Motor Condition Monitoring Using Industrial Wireless Sensor Networks**

Liquan Hou, Neil W. Bergmann

*2.20pm-2.40pm*

**Distributed Sensing, Communications, and Power in Optical Fibre Smart Sensor Networks for Structural Health Monitoring**

Graham Wild, Gary Allwood, Steven Hinckley

*2.40pm-3.00pm*

**The Effect of Correlation of Chemical Tracers on Chemical Sensor Network Performance**

Champake Mendis, Ajith Gunatilaka, Alex Skvortsov, Shanika Karunasekera

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**3.00pm-3.30pm: Coffee Break**

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**3.30pm-4.10pm**

**Session name: Key Note 7**

**Speaker: Prof. Ian Peterson**

**Bio:** Ian R. Petersen was born in Victoria, Australia, in 1956. He received the Ph.D. degree in electrical engineering in 1984 from the University of Rochester, Rochester, NY. From 1983 to 1985, he was a Postdoctoral Fellow at the Australian National University, Canberra. In 1985, he joined the University of New South Wales at the Australian Defence Force Academy, Canberra, where he is currently a Scientia Professor and an Australian Research Council Federation Fellow in the School of Information Technology and Electrical Engineering. His main research interests are in robust control theory, quantum control theory, and stochastic control theory. Dr. Petersen has served as an Associate Editor for the IEEE TRANSACTIONS ON AUTOMATIC CONTROL, SYSTEMS AND CONTROL LETTERS, Automatica, and the SIAM Journal on Control and Optimization. Currently, he is an Editor for Automatica

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### Parallel Session 6

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**Session Name: 6A - Sensor Networks Security**  
**Session Chair: Yee Wei Law, University of Melbourne, Australia**

*4.15pm-4.35pm*

**An Efficient Location-Dependent Key Management Scheme for Wireless Sensor Networks**

In-Tai Kim, Yi-Ying Zhang, Myong-Soon Park

*4.35pm-4.55pm*

**Anubis: An Attestation Protocol for Distributed Context-Aware Applications**

Senaka Buthpitiya, Feng-Tso Sun, Heng-Tze Cheng, Patrick Tague, Martin Griss, Anind K. Dey

*4.55pm-5.15pm*

**Detecting Intrusions Within RFID Systems Through Non-Monotonic Reasoning Cleaning**

Peter Darcy, Bela Stantic, Aikaterini Mitrokotsa, Abdul Sattar

**Session Name: 6B - Sensor Networks (Routing and MAC)**

**Session Chair: Andreas, Willig, University of Canterbury, New Zealand**

*4.15pm-4.35pm*

**Resolving RFID Data Stream Collisions Using Set-Based Approach**

Prapassara Pupunwiwat, Bela Stantic

*4.35pm-4.55pm*

**Packet Forwarding in Overlay Wireless Sensor Networks Using NashQ Reinforcement Learning**

Sajee Singsanga, Wipawee Hattagam, Ewe Hong Tat

*4.55pm-5.15pm*

**Distributed Semantic Algorithm for Power Constrained Publish/Subscribe Routing**

Muhammad Ikram Ashraf, Leonardo Goratti, Jussi Haapola, Carlos Pomalaza-Raez

*5.15pm-5.35pm*

**A Reactive Geographic Routing Protocol for Wireless Sensor Networks**

Rong Ding, Lei Yang

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**5.35pm: Program Closes**

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**6.30pm: Conference Dinner**

# 10<sup>th</sup> December, 2010 – Friday

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**8.00 am-5.00pm: Registration**

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## Parallel Session 7

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**Session Name: 7A - Sensor Networks in Healthcare (Information Processing in Healthcare)**  
**Session Chair: Ahsan Khandoker, University of Melbourne, Australia / Herbert Jelinek**

*8.30am-8.50am*

**Exploring Novel Features and Decision Rules to Identify Cardiovascular Autonomic Neuropathy Using a Hybrid of Wrapper-Filter Based Feature Selection**

Shamsul Huda, Herbert Jelinek, Biplob Ray, Andrew Stranieri, John Yearwood

*8.50am-9.10am*

**Unravelling Unique Qualitative and Quantitative Characteristics of the Surface Submentalis EMG in OSA Polysomnograms**

Mak Daulatzai, Chandan Karmakar, Neela Khan, Ahsan Khandoker, Marimuthu Palaniswami

*9.10am-9.30am*

**Nonlinear Active Noise Control with Virtual Sensing Technique**

Debi Prasad Das, Danielle J. Moreau, Ben Cazzolato

**Session Name: 7B - Sensor Networks (Target Tracking)**

**Session Chair: Wen Hu, CSIRO, Australia**

*8.30am-8.50am*

**Exploration of Adaptive Filters for Target Tracking in the Presence of Model Uncertainty**

Tracy Q.S. Truong

*8.50am-9.10am*

**Multifunction Array Lidar Network for Intruder Detection, Tracking, and Identification**

J.A. Krill, M.J. O'Driscoll, M.C. Gross, S.J. Papadakis, G.F. Ricciardi, J.S. Peri, I.N. Bankman

*9.10am-9.30am*

**A Distributed Protocol for Object Tracking in Wireless Multimedia Sensor Networks**

Junbin Liu, Damien O'Rourke, Tim Wark, Simon Denman, Sridha Sridharan

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**9.35am-10.15am**

**Session name: Key Note 8**

**Speaker: Prof. Peter Corke**

### **5 years of environmental wireless sensing**

The talk will cover a large body of work over 5 years in creating large-scale sensing and actuation networks for environmental monitoring. The earliest applications involved measurement of scalar variables such as temperature, humidity, water flow and salinity. Another class of applications involved audio or video sensing which presents real challenges for mote-class hardware and necessitates architectural extensions for the node. A final application class involves mobility. This includes sensing the position of cattle in the landscape to determine individual and social behaviour patterns, and ultimately actuating the animals to stay within defined spatial bounds. Mobility can also be considered in the integration of sensor networks and robots.

**Bio:** Peter is an electrical engineer by training and his research interests are field robotics, visual perception and wireless sensor networks. He is a professor of robotics and control at Queensland University of Technology, and previously led a pioneering program in mining, aerial and underwater robotics as well as sensor networks at CSIRO. He is a fellow of the IEEE, member of the RAS AdCom, editor-in-chief of the IEEE Robotics and Automation magazine, member of the editorial boards of the International Journal of Robotics Research and the Springer STAR series, founding editor of the Journal of Field Robotics and author of the Robotics Toolbox for Matlab. He has held visiting positions at Oxford University, Carnegie-Mellon University, University of Illinois at Urbana-Champaign and the University of Pennsylvania.

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## 10.15am- 10.45am: Coffee Break

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### Parallel Session 8

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**Session Name: 8A - Advances in Optimization  
(Localization with Sensor Networks)**

**Session Chair: Iman Shames**

*10.45am-11.05am*

**Optimal Sensor Separation for AoA Based  
Localization via Linear Sensor Array**

Sanvidha C.K. Herath, Pubudu N. Pathirana

*11.05am-11.25am*

**Maximum Likelihood Approach for Tracking  
Multiple Mobile Agents with a Moving Doppler  
Radar System**

Sanvidha C.K. Herath, Pubudu N. Pathirana

*11.25am-11.45am*

**Remarks on the Cramer-Rao Inequality for  
Doppler-Based Target Parameter Estimation**

Adrian N. Bishop, Matthew Smith

**Session Name: 8B - Sensor Networks (Novel  
Architectures)**

**Session Chair: Damien O'Rourke, CSIRO,  
Australia**

*10.45am-11.05am*

**RHA: A Robust Hybrid Architecture for  
Information Processing in Wireless Sensor  
Networks**

Thanh Dang, Nirupama Bulusu, Wu-chi Feng, Wen Hu

*11.05am-11.25am*

**A Fault-Tolerant Data Dissemination Based on  
Honeycomb Architecture for Mobile Multi-Sink  
Wireless Sensor Networks**

Aysegul Tuysuz Erman, Arta Dilo, Paul J.M. Havinga

*11.25am-11.45am*

**Towards a Scalable and Interoperable Global  
Environmental Sensor Network Using Service  
Oriented Architecture**

Rakhi Motwani, Mukesh Motwani, Frederick Harris  
Jr., Sergiu Dascalu

*11.45am-12.05am*

**SensorFeed: An Architecture for Model-Based  
Sensor Network Data Enrichment**

Ali Salehi, Mukaddim Pathan, Doug Palmer, Michael  
Compton

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## 12.15pm-1.00pm: Lunch

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**1.00pm-2.00pm**

**Session name: ISSNIP – e-Science Joint Keynote Talk**

**Speaker: Prof. S. George Djorgovski**, Professor of Astronomy, California Institute of Technology

**Towards the Virtualisation of Science (TBC)**

S. George Djorgovski is a Professor of Astronomy and a Co-Director of the Center for Advanced Computing Research at Caltech, and the Director of the Meta-Institute for Computational Astrophysics. After receiving his PhD from UC Berkeley, he was a Harvard Junior Fellow, before joining the Caltech faculty in 1987. He was a Presidential Young Investigator, an Alfred P. Sloan Foundation Fellow, among other honors and distinctions, and he is an author or coauthor of several hundred professional publications. (<http://www.astro.caltech.edu/~george/>)

He was one of the founders of the Virtual Observatory concept, and was the Chairman of the US Nat'l Virtual Observatory Science Definition Team. He was or is the PI or a Co-PI of several major digital sky surveys. His e-Scientific interests include definition and development of the universal methodology, tools, and frameworks for data-intensive and computationally-enabled science, various aspects of data mining and virtual scientific organizations. His astrophysical interests include digital sky surveys, exploration of observable parameter spaces, formation and early evolution of quasars, galaxies, and other cosmic structures, time-domain astronomy, and the nature of the dark energy.

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**2.00pm: Conference Closing**