

**Eighth International Conference on
Intelligent Sensors, Sensor Networks and Information Processing
IEEE ISSNIP 2013
April 2-5, 2013
The Langham, Melbourne, Australia**

Advance Program

Tuesday, 2 April 2013

08:30 am - 05:00 pm	Registration - Podium Secretariat	
09:00 am - 10:30 am	Tutorial 1A: Data Stream Mining for Sensor Networks with Applications for Smart Water Systems A/Prof. Shonali Krishnaswamy Monash University, Australia and Prof. Rachel Cardell-Oliver The University of Western Australia, Australia <i>Clarendon Ball Room A</i>	Tutorial 1B: Every Picture Tells A Story: Visual Approaches to Cluster Analysis Prof. Jim Bezdek University of Melbourne, Australia <i>Clarendon Ball Room C</i>
10:30 am - 11:00 am	Morning Tea - Pre-Function Area, Podium Level	
11:00 am - 12:35 pm	Tutorial 1A continued <i>Clarendon Ball Room A</i>	Tutorial 1B continued <i>Clarendon Ball Room C</i>
12:35 pm - 01:30 pm	Lunch - Pre-Function Area, Podium Level	
01:30 pm - 03:00 pm	Tutorial 2A: Particle Filters for Random Set Models Dr. Branko Ristic DSTO, Australia <i>Clarendon Ball Room A</i>	Tutorial 2B: Sense-T - An Economy-wide Sensor Network Dr. Greg Timms CSIRO, Australia <i>Clarendon Ball Room C</i>
03:00 pm - 03:30 pm	Afternoon Tea - Pre-Function Area, Podium Level	
03:30 pm - 05:00 pm	Tutorial 2A continued <i>Clarendon Ball Room A</i>	Tutorial 2B continued <i>Clarendon Ball Room C</i>
05:00 pm	Welcome cocktail (Full registrations and Invited guests only, please collect your ticket at the registration desk) <i>Swanston rooms, The Langham</i>	

Wednesday, 3 April 2013

08:30 am - 05:00 pm	Registration - Podium Secretariat		
09:00 am - 09:30 am	Conference Opening Opening Address: Prof. M. Palaniswami and Prof. V. Lumelsky <i>Clarendon Ball Room A</i>		
09:30 am - 10:30 am	Plenary 1: Two Models for Anomaly Detection in Wireless Sensor Networks, with Applications to Environmental Monitoring Speaker: Prof. Jim Bezdek University of Melbourne, Australia <i>Clarendon Ball Room A and B</i>		
10:30 am - 11:00 am	Morning Tea - Pre-Function Area, Podium Level		
11:00 am - 11:45 am	Invited Talk 1A: In Situ Structural Health Monitoring of Australian Defence Force Aircraft Speaker: Dr. Steve Galea DSTO, Australia <i>Yarra Room</i>	Invited Talk 1B: Human-Robot Interaction and Whole-Body Robot Sensing Speaker: Prof. Vladimir Lumelsky University of Wisconsin-Madison, USA <i>Clarendon Ball Room A</i>	Invited Talk 1C: From Data to Decision Making: Sensor Information Processing Speaker: Dr. Ziyuan Wang IBM Research, Australia <i>Clarendon Ball Room C</i>
11:45 am - 12:45 pm	Session 1A: Optical Sensors (3 papers) <i>Yarra Room</i>	Session 1B: WSN Applications (3 Papers) <i>Clarendon Ball Room A</i>	Session 1C: Information Processing 1 (3 papers) <i>Clarendon Ball Room C</i>
12:45 pm - 01:30 pm	Lunch - Pre-Function Area, Podium Level		
01:30 pm - 02:30 pm	Plenary 2: Wireless Structural Health Monitoring Speaker: Prof. Paul Havinga University of Twente, Netherlands <i>Clarendon Ball Room A and B</i>		
02:30 pm - 03:30 pm	Session 2A: Sensor Fusion and Tracking 1 (3 Papers) <i>Yarra Room</i>	Session 2B: Localisation and Clock Synchronisation (3 Papers) <i>Clarendon Ball Room A</i>	Session 2C: Information Processing 2 (3 papers) <i>Clarendon Ball Room C</i>
03:30 pm - 04:00 pm	Afternoon Tea - Pre-Function Area, Podium Level		
04:00 pm - 05:20 pm	Session 3A: Special Session on Sensors and Sensor Networks for Smart Structures and Structural Health Monitoring (3 papers) <i>Yarra Room</i>	Session 3B: WSN Security and Programming (4 Papers) <i>Clarendon Ball Room A</i>	Session 3C: Information Processing 3 (4 papers) <i>Clarendon Ball Room C</i>

Thursday, 4 April 2013

08:45 am - 05:00 pm	Registration - Podium Secretariat		
09:00 am - 10:00 am	Plenary 3: Finding Needles in Haystacks Speaker: Prof. Hugh Durrant-Whyte NICTA, Australia <i>Clarendon Ball Room A and B</i>		
10:00 am - 10:30 am	Morning Tea - Pre-Function Area, Podium Level		
10:30 am - 11:15 am	Invited Talk 2A: Extended Global Supply Chain Identification Framework Speaker: Prof. John Mo RMIT, Australia <i>Yarra Room</i>	Invited Talk 2B: Towards Continental-Scale Tracking of Flying Foxes Speaker: Dr. Raja Jurdak CSIRO, Australia <i>Clarendon Ball Room A</i>	Invited Talk 2C: Technology is the Answer. But What is the Question? Speaker: Andrew Wisdom Distilled Wisdom, Australia <i>Clarendon Ball Room C</i>
11:15 am - 12:35 pm	Session 4A: RFID Workshop 1 (4 papers) <i>Yarra Room</i>	Session 4B: WSN Energy Efficiency (4 Papers) <i>Clarendon Ball Room A</i>	Session 4C: Information Processing 4 (4 papers) <i>Clarendon Ball Room C</i>
12:35 pm - 01:30 pm	Lunch - Pre-Function Area, Podium Level		
01:30 pm - 02:30 pm	Plenary 4: Smart Secure Infrastructure Speaker: Prof. Jay Guo CSIRO, Australia <i>Clarendon Ball Room A and B</i>		
02:30 pm - 03:30 pm	Session 5A: RFID Workshop 2 (3 papers) <i>Yarra Room</i>	Session 5B: Special Session on Internet of Things for Smart Cities (3 Papers) <i>Clarendon Ball Room A</i>	Session 5C: Special Session on Biomedical Sensors and Point of Care Devices for Health Monitoring (3 papers) <i>Clarendon Ball Room A</i>
03:30 pm - 04:00 pm	Afternoon Tea - Pre-Function Area, Podium Level		
03:30 pm - 05:30 pm	Poster Session (22 Posters, Work in progress posters) <i>Clarendon Ball Room B</i>		
07.00 pm - 10.00 pm	Conference Dinner (Full registrations and Invited guests only, please collect your ticket at the registration desk) Awards for Best Paper, Best Student Paper <i>Alto, Level 25, The Langham</i>		

Friday, 5 April 2013

08:30 am - 05:00 pm	Registration - Podium Secretariat		
09:00 am - 10:00 am	Plenary 5: Lensfree On-Chip Microscopy and Tomography Toward Telemedicine Applications Speaker: Prof. Aydogan Ozcan University of California, Los Angeles, USA <i>Clarendon Ball Room A and B</i>		
10:00 am - 10:30 am	Morning Tea - Pre-Function Area, Podium Level		
10:30 am - 11:15 am	Invited Talk 3A: Intelligent Optical Fibre Based Perimeter Security Systems Speaker: Dr. Jim Katsifolis Future Fibre Technologies, Australia <i>Yarra Room</i>	Invited Talk 3B: Three-Dimensional Thin Film Lithium Batteries for Miniaturized Power Sources Speaker: Prof. Menachem Nathan Tel Aviv University, Israel <i>Clarendon Ball Room A</i>	Invited Talk 3C: Connecting Government-Centric Applications Through a Unified Sensing and Sense-Making Architecture Speaker: Dr. Hwee-Pink Tan Institute for Infocomm Research (I ² R), A*STAR, Singapore <i>Clarendon Ball Room C</i>
11:15 am - 12:35 pm	Session 6A: Intelligent Sensors - MEMS (4 Papers) <i>Yarra Room</i>	Session 6B: WSN Communication and Networking Protocols (4 Papers) <i>Clarendon Ball Room A</i>	Session 6C: Information Processing 5 (4 papers) <i>Clarendon Ball Room C</i>
12:35 pm - 01:30 pm	Lunch - Pre-Function Area, Podium Level		
01:30 pm - 02:30 pm	Plenary 6: From Poor Multi-Binary Sensors to Rich Environmental Sensing Speaker: Prof. Paulo de Souza University of Tasmania, Australia <i>Clarendon Ball Room A and B</i>		
02:30 pm - 03:30 pm	Session 7A: Sensor Fusion and Tracking 2 (3 Papers) <i>Yarra Room</i>	Session 7B: WSN Coverage and Storage (3 Papers) <i>Clarendon Ball Room A</i>	Session 7C: Information Processing 6 (3 papers) <i>Clarendon Ball Room C</i>
03:30 pm - 04:00 pm	Afternoon Tea - Pre-Function Area, Podium Level		
04:00 pm - 05:00 pm	Concluding Plenary: Large Scale Anomaly Detection in Video Streams Speaker: Prof. Svetha Venkatesh Deakin University, Australia Concluding Remarks <i>Clarendon Ball Room A and B</i>		

2nd April, 2013 – Tuesday

8.30 am - 5:00 pm: Registration

9.00am-10.30am

11am-12:35 pm

Session name: Tutorial 1A: Data Stream Mining for Sensor Networks with Applications for Smart Water Systems

Speakers: A/Prof. Shonali Krishnaswamy, Monash University, Australia, and Prof. Rachel Cardell-Oliver, University of Western Australia, Australia

Data Stream Mining for Sensor Networks with Applications for Smart Water Systems

During the last decade many sensor networks have been deployed to gather fine-grained, spatial-temporal data. Application domains include agriculture, health care, transport and urban monitoring. The benefits of collecting large volumes of data with a sensor network are, however, only fully realised when that data is transformed into meaningful information for decision support. In particular, when interesting patterns can be discovered in the data, data mining research provides innovative data processing techniques for discovering patterns in large data sets, such as those generated by sensor networks.

This tutorial will provide an introduction to the main data mining techniques that are applicable to sensor network data sets. The tutorial will provide a practical introduction to the subject, with hands-on exercises using state of the art data mining software. A case study on smart metering in urban water systems will be used to highlight some of the real-world challenges in this research area.

Bio: A/Prof. Shonali Krishnaswamy is currently on a leave of absence from Monash University and is the Head, Data Analytics Department at the Institute for Infocomm Research (I2R), Singapore. Shonali holds a continuing/tenured appointment as an Associate Professor in the Faculty of Information Technology at Monash University. Prior to this Shonali was a Senior Lecturer (2006 - 2009) and an Australian Research Council (ARC) Australian Post Doctoral (APD) Fellow (2003-2005) at Monash University.

She was the Director of the Centre for Distributed Systems and Software Engineering which is one of the five research centres in the Faculty of IT from (2010-2011). She was the Higher Degrees by Research Coordinator (2009 - 2010) for the Caulfield School of IT. Shonali holds a PhD (Computer Science, 2003) and Master of Computing (1998) from Monash University, a Bachelor Science (Computer Science, 1996) from the University of Madras, India, and a Graduate Certificate in Higher Education (2006) from Monash University. Shonali has received the following awards/fellowships since commencing her academic career in 2003.

Bio: Prof. 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

11am-12:35 pm

Session name: Tutorial 1 B: Every Picture Tells a Story: Visual Approaches to Cluster Analysis

Speaker: Prof. Jim Bezdek, University of Melbourne, Australia

Every Picture Tells a Story: Visual Approaches to Cluster Analysis

Cluster analysis is the art and science of making computers discover clusters in numerical data. I begin with a discussion of the differences between the human and computer points of view about clusters. Definitions and examples of the three canonical problems of cluster analysis: tendency assessment, clustering, and cluster validity. Notation and basic structure of the computational problem.

Next I give a short history of visual approaches for the canonical problems of clustering. The use of manually drawn images began in 1873. I will trace the role of computers in the evolution of reordered dissimilarity images (aka "cluster heat maps") for visual clustering.

Definitions and examples of the VAT (visual assessment of tendency), recursive, improved (iVAT) and asymmetric VAT/iVAT (asiVAT) approaches for building a reordered dissimilarity image from relational data. The resultant images often (but not always) provide good visual evidence for clusters in the data, and more importantly, they provide estimates of how many clusters to look for. Examples are drawn from psychology, eldercare monitoring, social network analysis, and network security (role-based access control).

The scalable VAT (sVAT) model and algorithm are developed for visual approaches to very large ("big") data. Extensions of VAT/iVAT/asiVAT for arbitrarily large square data are based on a simple minimax sampling scheme. Applications include estimates of structure in big Gaussian mixtures and large image data.

The last topic deals with estimates of cluster structure in rectangular relational data. This is a basic concern in the field of co-clustering (aka "bi-clustering"). Two versions of coVAT and their extension to scalable coVAT for arbitrarily large rectangular data are developed. All of these rectangular models can be used with VAT/iVAT/asiVAT, and they all provide estimates of the number of probable clusters for each of the four clustering problems associated with rectangular data. We illustrate this idea with an example of gene regulation from bioinformatics.

Bio: Jim received the PhD in Applied Mathematics from Cornell University in 1973. Jim is past president of NAFIPS (North American Fuzzy Information Processing Society), IFSA (International Fuzzy Systems Association) and the IEEE CIS (Computational Intelligence Society): founding editor the Int'l. Jo. Approximate Reasoning and the IEEE Transactions on Fuzzy Systems: Life fellow of the IEEE and IFSA; and a recipient of the IEEE 3rd Millennium, IEEE CIS Fuzzy Systems Pioneer, and IEEE technical field award Rosenblatt medals. Jim's interests: woodworking, optimization, motorcycles, pattern recognition, cigars, clustering in very large data, fishing, co-clustering, blues music, wireless sensor networks, poker and visual clustering. Jim retired in 2007, and will be coming to a university near you soon.

10.30am- 11.00am: Coffee Break

12.35pm-1.30pm: Lunch

1.30pm-3.00pm

3.30pm-5.00pm

Session name: Tutorial 2A: Particle Filters for Random Set Models

Speaker: Dr. Branko Ristic, DSTO, Australia

Particle Filters for Random Set Models

The tutorial presents a hands-on engineering approach to sequential Bayesian state estimation of stochastic dynamic systems using random set models. Over the last decade, particle filters have become one of the essential tools for stochastic nonlinear non-Gaussian filtering. Practical application ranges from navigation and autonomous vehicles to bioinformatics and finance. While particle filters have been around for almost two decades, the recent theoretical developments of sequential Bayesian estimation, in the framework of random set theory, have provided new opportunities which are not widely known. The tutorial is devoted to a new generation of particle filters, applicable to a wider class of signal processing applications. The theoretical concepts and the performance of developed particle filters are illustrated by practical application which includes: calibration of multi-target systems, prediction of the spread of an epidemic, processing spatially referring natural language statements, and video tracking of pedestrians.

Bio: Dr. Branko Ristic received all degrees in electrical engineering: Ph.D. (QUT, 1995), M.Sc. (Belgrade University, 1991), and B. Eng. (University of Novi, 1984). Dr Ristic held various research/engineering positions in former Yugoslavia (until 1989) and Australia before joining the Australian Defence Science and Technology Organisation (DSTO) in 1996, where he stayed until present. During 2003/04 he spent a year in IRIDIA (Universite libre de Bruxelles, Belgium). Since 2006 he is an Honorary Fellow of The University of Melbourne. His research interests include nonlinear filtering, target tracking, sensor fusion and reasoning under uncertainty, with a particular emphasis on defence and security applications. He published over 60 journals and 100 conference papers, and was a recipient of the best-paper award on a few occasions. He co-authored

a bestseller *Beyond the Kalman filter* (Artech House, 2004) and was the Chair of the Fourth Australian Data Fusion Symposium in 2007. In 2009 he was awarded a DSTO Fellowship.

1.30pm-3.00pm

3.30pm-5.00pm

Session name: Tutorial 2B: Sense-T – An Economy-wide Sensor Network

Speaker: Dr. Greg Timms, CSIRO, Australia

Sense-T – An Economy-wide Sensor Network

Sense-T is a world-leading economy-wide intelligent sensor network that integrates different data sources across the whole of Tasmania. It is a partnership between the University of Tasmania, CSIRO, the Tasmanian Government and IBM and offers the opportunity to test new approaches to address global challenges that can then be scaled in a cost effective manner elsewhere. Research dollars go further by using Sense-T's core infrastructure and data.

Sense-T will aggregate historical, spatial and real-time sensor data and make this available via an application platform for an array of information and services. Application programming interfaces (APIs) will be published to make it easy to develop applications using Sense-T's core infrastructure.

Initial projects have started in food and agriculture production optimisation through collecting real-time information about weather, environmental factors, soil moisture, animal health and inputs (fertilisers, irrigation, chemicals) on farms. This will be combined using data analytics to create a range of decision support systems for farmers designed to optimise production and reduce environmental impact (dairy, beef, viticulture & fruit, aquaculture) as well as for regulators to ensure high levels of food safety whilst optimising production (oysters).

In this tutorial, we will investigate the Sense-T Program in detail and look at the opportunities it provides for government, industry and research.

Bio: Greg Timms received the B.Sc. (Hons) and Ph.D. degrees in physics from the University of Sydney, Australia, in 1993 and 1997 respectively. In 1997, he joined the Australian Nuclear Science and Technology Organisation where he spent five years investigating the environmental impacts of mining, focusing on the physical transport of reactants and pollutants within mine wastes.

Since 2002, Greg has been with the Commonwealth Scientific and Industrial Research Organisation (CSIRO), initially engaged in research on microwave communication networks and then leading a team which developed a novel 190 GHz millimetre-wave imager in 2006. For the past six years Greg has been based at the Intelligent Sensing and Systems Lab (ISSL) at CSIRO's Hobart site, where he has been part of a team developing low-cost sensor network and information system technologies for deployment in marine and terrestrial environments. Greg's particular interest is in techniques for automated quality control of real-time streaming data. He is the Deputy Research Director of ISSL and co-ordinates the Sense-T activities across CSIRO.

3.00pm- 3.30pm: Coffee Break

5.00pm: Program Closes

5:00pm: Welcome Cocktail

(Full registrations and Invited guests only, please collect your ticket at the registration desk)

3rd April, 2013 – Wednesday

8.30 am - 5:00 pm: Registration

9.00am-9.30am

Session name: IEEE ISSNIP 2013 Conference Opening

Opening Address: Prof. Marimuthu Palaniswami and Prof. Vladimir Lumelsky

9.30am-10.30am

Session name: Plenary 1: Two Models for Anomaly Detection in Wireless Sensor Networks, with Applications to Environmental Monitoring

Speaker: Prof. Jim Bezdek, University of Melbourne, Australia

Two Models for Anomaly Detection in Wireless Sensor Networks, with Applications to Environmental Monitoring

This talk summarizes two elliptical models for anomaly detection in wireless sensor networks: ESAD, a model for static analysis; and IDCAD, a model for dynamic streaming analysis. These models were developed in the context of anomaly detection in sensor networks, but they should generalize well to detection of unusual events in other application domains.

The basic architecture of the ESAD model: (i) convert collected data to elliptical summaries at each node; (ii) build a dissimilarity matrix on pairs of ellipses; (iii) reorder the matrix to reveal cluster structure by visual inspection of an image of the data; (iv) cluster the matrix with single linkage using the information from (iii) as a guide; (v) hold your breath and hope for the best. We will explain steps (i)-(iv) today. Step (v) is optional.

The IDCAD model also depends on elliptical geometry, but in a much different way. Chains of ellipses are built as the data streams in, and the transition distance between successive pairs of ellipses plays the key role in change detection. Numerical examples include real data from the IBRL network, the Great Barrier Reef Ocean Observation System, and two networks of weather stations at the Grand St. Bernard pass and in Le Genepi, Switzerland.

Bio: Jim received the PhD in Applied Mathematics from Cornell University in 1973. Jim is past president of NAFIPS (North American Fuzzy Information Processing Society), IFSA (International Fuzzy Systems Association) and the IEEE CIS (Computational Intelligence Society): founding editor the Int'l. Jo. Approximate Reasoning and the IEEE Transactions on Fuzzy Systems: Life fellow of the IEEE and IFSA; and a recipient of the IEEE 3rd Millennium, IEEE CIS Fuzzy Systems Pioneer, and IEEE technical field award Rosenblatt medals. Jim's interests: woodworking, optimization, motorcycles, pattern recognition, cigars, clustering in very large data, fishing, co-clustering, blues music, wireless sensor networks, poker and visual clustering. Jim retired in 2007, and will be coming to a university near you soon.

10.30am- 11.00am: Coffee Break

11.00am-11.45am

Session name: Invited Talk 1A: In Situ Structural Health Monitoring of Australian Defence Force Aircraft

Speaker: Dr. Steve Galea, DSTO, Australia

In Situ Structural Health Monitoring of Australian Defence Force Aircraft

The Australian Defence Science and Technology Organisation (DSTO) has a program of work aimed at developing a suite of in-situ structural health monitoring (SHM) systems for retro-fitting to existing Australian Defence Force (ADF) aircraft. The approach is to develop systems that will fit seamlessly into existing aircraft structural integrity management programs. The technologies range from rapid operational loads measurement (ROLM) system, to a broad area, low transducer density damage-diagnostic approach using acousto-ultrasonics (AU) and finally thermoelastic stress analysis (TSA) for damage diagnostics and prognostics. The ROLM approach allows the operator to rapidly attach and remove strain sensors on the aircraft to provide the manager with operational load measurement, when required. The AU approach uses guided elastic waves produced by a fixed source, typically a piezoceramic element, and sensed at a separate receiving location where variations from the baseline response are used to identify damage within the wave path. The TSA approach uses remote IR detectors within the structure to measure operational loads, locate structural 'hot spots', monitoring crack growth and evaluate stress intensity factors. The goal of this paper is to provide an overview of the activities within DSTO for the development, validation and implementation of these SHM approaches for the ADF.

Bio: Dr. Steve Galea graduated in 1980 with a B.E. (Mech) from the University of Queensland with first class honours and in 1983, he received a M. Eng. Sc. He commenced employment with the Aeronautical Research Laboratory in 1983. In 1985 he commenced studies at the Institute of Sound and Vibration Research, University of Southampton, UK and received his Ph. D. from the University of Southampton in 1989. Dr Galea is currently a Principal Research Scientist and Functional Head of the Smart Structures and Advanced Diagnostics Group within Air Vehicles Division in DSTO. His current responsibilities involve the management of research and providing technical leadership on the development and application of smart materials and structures technologies to aircraft structures, including in-situ structural health monitoring and self-powering techniques. He has an extensive publication record of over 90 publications, which include three book chapters on smart structures and repairs to acoustically-fatigue structures. Dr Galea is a member of the Editorial Board on the International Journal of Structural Health Monitoring and is the section editor of the Aerospace Applications section in the Encyclopaedia of Structural Health Monitoring.

11.00am-11.45am

Session name: Invited Talk 1B: Human-Robot Interaction and Whole-Body Robot Sensing

Speaker: Prof. Vladimir Lumelsky, University of Wisconsin-Madison, USA.

Human-Robot Interaction and Whole-Body Robot Sensing

Applications that have a need in robots operating in an uncertain environment, and/or require close human-robot interaction, are in great demand. Examples include robots preparing the Mars surface for human arrival; robots for assembly of large space telescopes; robot helpers for the elderly; robotic search and disposal of war mines. Advances in this area, while impressive, are also slow to appear. Difficulties are multiple, both on the robotics and on human side: robots have hard time adjusting in unstructured tasks, while human cognition has serious limits in manipulating 3D motion. As a result, applications where robots operate near humans - or far away from them - are exceedingly rare. The way out of this impasse is to supply the robot with a whole-body sensing, plus related intelligence - an ability to sense surrounding objects at the robot's whole body and utilize this data in real time. This calls for large-area flexible arrays - sensitive skin covering the whole robot body. Whole-body sensing brings interesting, even unexpected, properties: robots become inherently safe; human operators can move them fast, with "natural" speeds; resulting robot motion strategies exceed human spatial reasoning skills; natural synergy of human-robot teams becomes realistic; a mix of supervised and unsupervised operation becomes possible. We will review the algorithmic, cognitive science, hardware (materials, electronics, computing), and control issues involved in realizing such systems.

Bio: Dr. Lumelsky is Professor Emeritus in University of Wisconsin-Madison. His Ph.D. in Applied Math is from the Institute of Control Sciences, Russian National Academy of Sciences, Moscow. He has held research and faculty positions with Ford Motor Research Labs, General Electric Research Center, Yale University, UW-Madison, University of Maryland, NASA-Goddard Space Center. Concurrently he held visiting positions with the Tokyo Institute of Science, Japan; Weizmann Institute, Israel; USA National Science Foundation; USA-Antarctica South Pole Station; NASA.

He has served on Editorial Boards of IEEE Transactions on Robotics and Automation, IEEE Sensors Journal (as Founding Editor-in-Chief), and other journals; on governing bodies and committees of IEEE (including IEEE Fellow Committee), IEEE Robotics and Automation Society, IEEE Sensors Council (currently as President); served as chair and co-chair of major international conferences, and guest editor for special journal issues. He has served as consultant to NSF, DARPA, European Commission, and as a litigation technical witness (expert) in court cases. He has authored over 200 publications (books, journal papers, conferences, reports); is IEEE Life Fellow, and member of ACM and SME.

11.00am-11.45am

Session name: Invited Talk 1C: From Data to Decision Making: Sensor Information Processing

Speaker: Dr. Ziyuan Wang, IBM Research, Australia

From Data to Decision Making: Sensor Information Processing

Recently we have witnessed a proliferation of sensor network technologies and sensing applications, posing a number of challenges to process sensed information to reach meaningful outcomes. This talk covers the way we envision information processing based on streams from diverse sources including sensors feeding it into a network of models and making it available to decision makers. Some of the example systems to aid the information processing and decision making are Sense-T, VINE (the Victorian Information Network for Emergencies), fine grained weather forecasting, fire and flood modelling and evacuation planning. Sense-T, a collaborative project between UTAS, CSIRO and IBM research, aims to integrate data from different sources, manage real-time and historical data, and make it available to the community through user-friendly applications. This talk provides a general view on information processing from acquisition over using a network of models to processing the data all the way to visualising it for best cognitive context of the decision maker. Beyond Sense-T, IBM research-Australia is using the same core technology to work with the Victorian Fire commissioner and the Victorian Information Network for Emergencies. These efforts are within the broad umbrella of systems of systems. Later part of the talk will cover a few representative projects from the systems of systems initiatives.

Bio: Dr. Ziyuan Wang is a research scientist at IBM research Australia. Her work focuses on Smarter Cities initiative, in particular on intelligent transportation systems, sensor data management, and natural disaster management. Before joining IBM, Ziyuan worked for CSIRO Marine and Atmospheric Research division, where she was involved in environmental modelling, remote sensing data management, and scientific workflows. Ziyuan obtained a PhD in Computer Science from the University of Melbourne, specialising on on proactive traffic control strategies for sensor-enabled cars. She has published in reputed international journals and conferences.

She serves as a PC member and reviewer for a few conferences, as well as holds editorial board membership in the International Journal of Internet and Distributed Computing Systems.

Parallel Session 1

Session Name: 1A - Optical Sensors (3 papers)

11:45am-12:05pm

Experimental Multi-Parameter Sensing by Two Types of SMS-FBG

Baoyong Li (Harbin Engineering University, China); Shuo Fang (Harbin Engineering University, China); Yanan Liu (Harbin Engineering University, China); Dawei Song (Harbin Engineering University, China); Jiangzhong Zhang (Harbin Engineering University, China); Gangding Peng (University of New South Wales, Australia); Weimin Sun (Harbin Engineering University, China); Libo Yuan (Harbin Engineering University, China)

12:05pm-12:25pm

Regenerated Gratings for High Temperature Environments: T, strain and Breaking Point Analysis

Tao Wang (University of Sydney, Australia); Li-Yang Shao (University of Sydney, Australia); John Canning (University of Sydney, Australia); Kevin Cook (University of Sydney, Australia)

12:25pm-12:45pm

Birefringence Imaging for Optical Sensing of Tissue Damage

Lixin Chin (University of Western Australia, Australia); Xiaojie Yang (University of Western Australia, Australia); Robert A. McLaughlin (University of Western Australia, Australia); Peter B. Noble (University of Western Australia, Australia); David D. Sampson (University of Western Australia, Australia)

Session Name: 1B - WSN Applications (3 papers)

11:45am-12:05pm

TrigSense: Accelerometer Triggered Audio sensing for Traffic Condition Monitoring

Rohan Banerjee (Tata Consultancy Services, India); Aniruddha Sinha (Tata Consultancy Services, India)

12.45pm-1.30pm: Lunch

12:05pm-12:25pm

Experiences with Occupancy Based Building Management Systems

Nipun Batra (IIIT-Delhi, India); Pandarasamy Arjunan (IIIT-Delhi, India); Amarjeet Singh (IIIT-Delhi, India); Pushpendra Singh (IIIT-Delhi, India)

12:25pm-12:45pm

Discovering Water Use Activities for Smart Metering

Rachel Cardell-Oliver (University of Western Australia, Australia)

Session Name: 1C - Information Processing 1 (3 papers)

11:45am-12:05pm

Scalable Single Linkage Hierarchical Clustering For Big Data

Timothy C. Havens (Michigan Technological University, USA); James C. Bezdek (University of Melbourne, Australia); Marimuthu Palaniswami (University of Melbourne, Australia)

12:05pm-12:25pm

Person-Independent Facial Expression Recognition via Hierarchical Classification

Mingliang Xue (Curtin University, Australia); Wanquan Liu (Curtin University, Australia); Ling Li (Curtin University, Australia)

12:25pm-12:45pm

Combined Multiclass Classification and Anomaly Detection in Large-Scale Wireless Sensor Networks

Alistair Shilton (University of Melbourne, Australia); Sutharshan Rajasegarar (University of Melbourne, Australia)

1.30pm-2.30pm

Session name: Plenary 2: Wireless Structural Health Monitoring

Speaker: Prof. Paul Havinga, University of Twente, Netherlands

Wireless Structural Health Monitoring

Vibration is a daily occurrence in a wide range of machinery used in industries such as manufacturing, aerospace, petro-chemical and building and construction. One of the major problems of vibration is that it causes wear and tear which in many instances can lead to equipment or structural failure. Similarly, structural health monitoring of buildings, bridges, tunnels and other structures is estimating the state of structural health, or detecting the changes in structure that influence its performance. To prevent failures, it is essential to not only monitor vibration and stress levels but also to try and understand the underlying causes.

Wireless sensor networks enable dense in-situ sensing and simplify deployment of instrumentation. This presentation will give a general overview of some of the most important requirements dictated by reliable structural health monitoring applications most of wireless sensor networks have to comply with. Then main characteristics of wireless sensor networks used are discussed including network topology and architectures, real-time restrictions, reliability, power consumption, and life-time issues. Some of the deployment issues and solutions are illustrated by examples of a wireless sensor/actuator network for structural health monitoring developed within the European projects Clam, Wibrate and Genesi.

Bio: Prof. Paul J.M. Havinga is full professor and chair of the Pervasive Systems research group at the Computer Science department at the University of Twente in the Netherlands. He received his PhD at the University of Twente on the thesis entitled "Mobile Multimedia Systems" in 2000, and was awarded with the 'DOW Dissertation Energy Award' for this work.

His research themes have focused on wireless sensor networks, large-scale distributed systems, and energy-efficient wireless communication. The common theme in these areas is on the development of large-scale, heterogeneous, wireless, distributed systems. Research questions cover architectures, protocols, programming paradigms, algorithms, and applications. This research has resulted in many scientific publications in journals and conferences. He is programme leader of the Graduate Research programme 'Wireless and Sensor Systems' at the University of Twente, and scientific leader of the ICT Innovation Platform Sensor Networks.

He has a significant experience as project manager in several international research projects on wireless sensor networks. In 2001 he initiated the first European project on wireless sensor networks EYES, and many national and international projects evolved from this. 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. In 2008 he co-founded the company Inertia Technology that develops activity recognition solutions with body area networks, based on completely wireless inertial sensing systems.

Parallel Session 2

Session Name: 2A - Sensor Fusion and Tracking 1 (3 Papers)

2:30pm-2:50pm

Dual-band Modified Complementary Split Ring Resonator (MCSRR) Based Multiresonator Circuit for Chipless RFID Tag

Md. Shakil Bhuiyan (Monash University, Australia); A.K.M. Azad (Monash University, Australia); Nemai Chandra Karmakar (Monash University, Australia)

2:50pm-3:10pm

Tracking a Coordinated Group Using Expectation Maximisation

Roslyn A. Lau (DSTO, Australia); Jason L. Williams (DSTO, Australia)

3:10pm-3:30pm

Study on Estimation of Peak Ground Reaction Forces using Tibial Accelerations in Running

Edgar Charry (dorsaVi Pty. Ltd., Australia); Wenzheng Hu (dorsaVi Pty. Ltd., Australia); Muhammad Umer (dorsaVi Pty. Ltd., Australia); Andrew Ronchi (dorsaVi Pty. Ltd., Australia); Simon Taylor (Victoria University, Australia)

Session Name: 2B - Localisation and Clock Synchronisation (3 Papers)

2:30pm-2:50pm

Distributed Data Acquisition Unit with Microsecond-Accurate Wireless Clock Synchronisation

Philip Cadell (Queensland University of Technology, Australia); Ben Upcroft (Queensland University of Technology, Australia)

2:50pm-3:10pm

Node Deployment Strategy for WSN-based Node-Sequence Localization Considering Specific Paths

Chun-Chieh Hsiao (Lunghwa University of Science & Technology, Taiwan); Yi-Jhong Tsai (Lunghwa University of Science & Technology, Taiwan); Wen-Dian Zheng (Lunghwa University of Science & Technology, Taiwan)

3:10pm-3:30pm

Embracing Localization Inaccuracy: A Case Study

Usman Raza (FBK, Italy); Amy L. Murphy (FBK, Italy); Gian Pietro Picco (Università di Trento, Italy)

Session Name: 2C - Information Processing 2 (3 papers)

2:30pm-2:50pm

Dealing with Missing Sensor Values in Predicting Shellfish Farm Closure

Ashfaqur Rahman (CSIRO, Australia); Claire D'Este (CSIRO, Australia); Greg Timms (CSIRO, Australia)

2:50pm-3:10pm

Multiple Classifier System for Automated Quality Assessment of Marine Sensor Data

Ashfaqur Rahman (CSIRO, Australia); Daniel V. Smith (CSIRO, Australia); Greg Timms (CSIRO, Australia)

3:10pm-3:30pm

Wireless Sensing Platform for Remote Monitoring and Control of Wine Fermentation

Damith C. Ranasinghe (University of Adelaide, Australia); Nickolas J.G. Falkner (University of Adelaide, Australia); Chao Pan (University of Adelaide, Australia); Hao Wu (University of Adelaide, Australia)

3.30pm- 4.00pm: Coffee Break

Parallel Session 3

Session Name: 3A - Special Session on Sensors and Sensor Networks for Smart Structures and Structural Health Monitoring (3 Papers)

4:00pm-4:20pm

Estimation of Strain of Distorted FBG Sensor Spectra Using a Fixed FBGfilter Circuit and an Artificial Neural Network

Gayan C. Kahandawa (University of Southern Queensland, Australia); Jayantha Epaarachchi (University of Southern Queensland, Australia); K.T. Lau (Hong Kong Polytechnic University, China); John Canning (University of Sydney, Australia)

4:20pm-4:40pm

Energy Harvesting from Heavy Haul Railcar Vibrations

Chandarin Ung (Monash University, Australia); Scott D. Moss (DSTO, Australia); Luke A. Vandewater (DSTO, Australia); Steve C. Galea (DSTO, Australia); Wing K. Chiu (Monash University, Australia); Greg Crew (Monash University, Australia)

4:40pm-5:00pm

A Distributed Sensing Capability for in situ Time-Domain Separation of Lamb Waves

Nik Rajic (DSTO, Australia); Cédric Rosalie (DSTO, Australia); Claire Davis (DSTO, Australia); Patrick Norman (DSTO, Australia)

Session Name: 3B - WSN Security and Programming (3 Papers)

4:00pm-4:20pm

Privacy-Preserving Data Aggregation in Participatory Sensing Networks

Sarah M. Erfani (University of Melbourne, Australia); Shanika Karunasekera (University of Melbourne, Australia); Christopher Leckie (University of Melbourne, Australia); Udaya Parampalli (University of Melbourne, Australia)

4:20pm-4:40pm

Concealing the Complexity of Node Programming in Wireless Sensor Networks

Sebastian Bader (Mid Sweden University, Sweden); Bengt Oelmann (Mid Sweden University, Sweden)

4:40pm-5:00pm

Resource-Aware Broadcast Encryption for Selective-Sharing in Mobile Social Sensing

Ashay Dua (Portland State University, USA); Nirupama Bulusu (Portland State University, USA)

5:00pm-5:20pm

IP-Enabled Smart Sensor and Actuator Node for Ambient Intelligence Systems

Kevin I-Kai Wang (University of Auckland, New Zealand); Zoran Salcic (University of Auckland, New Zealand); Udayanto Dwi Atmojo (University of Auckland, New Zealand); Bhaskar Pediredla (University of Auckland, New Zealand); Mohammad Hadi (University of Auckland, New Zealand); Cyrus Daji (University of Auckland, New Zealand)

Session Name: 3C - Information Processing 3 (4 papers)

4:00pm-4:20pm

A Novel Detection Approach Using Bio-Inspired Vision for Enhanced Object Tracking in Video

James A. Dowley (University of South Australia, Australia); Kutluyıl Doğançay (University of South Australia, Australia); Russell S.A. Brinkworth (University of South Australia, Australia)

4:20pm-4:40pm

Autonomous Detection of Different Walking Tasks Using End Point Foot trajectory Vertical Displacement Data

Braveena K. Santhiranayagam (Victoria University, Australia); Daniel T.H. Lai (Victoria University, Australia); Alistair Shilton (University of Melbourne, Australia); Rezaul Begg (Victoria University, Australia); Marimuthu Palaniswami (University of Melbourne, Australia)

4:40pm-5:00pm

Evaluation of Incentives for Body Area Network-based HealthCare Systems

Siavash Aflaki (University of Twente, The Netherlands); Nirvana Meratnia (University of Twente, The Netherlands); Mitra Baratchi (University of Twente, The Netherlands); Paul J.M. Havinga (University of Twente, The Netherlands)

5:00pm-5:20pm

Low-Power Appliance Monitoring Using Factorial Hidden Markov Models

Ahmed Zoha (University of Surrey, UK); Alexander Gluhak (University of Surrey, UK); Michele Nati (University of Surrey, UK); Muhammad Ali Imran (University of Surrey, UK)

5.20pm: Program Closes

4th April, 2013 – Thursday

8.45 am - 5:00 pm: Registration

9.00am-10.00am

Session name: Plenary 3: Finding Needles in Haystacks

Speaker: Prof. Hugh Durrant-Whyte, NICTA, Australia

Finding Needles in Haystacks

Australia is capturing and building a large number of massive data sets describing the natural environment. These range from continent-wide geological and geochemical data acquired from a growing range of geophysical sensing campaigns to terrestrial and marine environment data captured from a variety of platforms as part of the NCRIS national infrastructure programs.

Managing and extracting value from these massive environmental data sets is a defining challenge in information technology which has the opportunity to bring about a transformational change to the way we understand, manage and steward our world. Addressing this challenge will require major coordinated advances in three key areas: Information Assimilation, Feature Discovery and Distributed Computation. This talk will describe NICTA's work in this area with reference to a number of projects in the geological and environmental sensing arena.

Bio: Prof. Hugh Durrant-Whyte is the CEO of National ICT Australia (NICTA). He was previously Professor of Mechatronic Engineering at University of Sydney, an ARC Federation Fellow, Director of the ARC Centre of Excellence for Autonomous Systems and of the Australian Centre for Field Robotics (ACFR). He has published over 350 research papers and founded four successful start-up companies. He has won numerous awards and prizes for his work, including the 2009 ATSE Clunes Ross Award. He is a Fellow of the Academy of Technological Sciences and Engineering (FTSE), of the IEEE (FIEEE), of the Australian Academy of Science (FAA), and the Royal Society (FRS). He was named the 2008 Professional Engineer of the Year by the Institute of Engineers Australia Sydney Division and the 2010 NSW Scientist of the Year.

10.00am- 10.30am: Coffee Break

10.30am-11.15am

Session name: Invited Talk 2A: Extended Global Supply Chain Identification Framework

Speaker: Prof. John Mo, RMIT, Australia

Extended Global Supply Chain Identification Framework

Supply chain information infrastructure has been largely built on the basis of proprietary IT systems using static identification technology such as barcode. The need to identify items individually for the purposes of security, loss reduction in recall, maintenance and upgrades has demanded the use of Radio Frequency Identification (RFID) technology. However, since the re-emergence of the technology in the last decade, the uptake of this technology is fragmented. Some large organisations such as Walmart, airports, global logistics companies use RFID as the tracking mechanism. Small to medium enterprises (SME) in the supply chain do not have the same resources as large multinational corporations are often left without the required interface and connectivity, hence the information link is broken, leading to inefficiency and inaccuracy within the supply chain. This paper reviews the developments of RFID applications in industry in recent years. Based on the review, a new global supply chain identification framework is proposed to enable open access via Application Program Interface (API) interfaces. The open identification framework integrates identification information from different technologies including RFID, GPS, etc using the concept of collaboration services to key stakeholders. The aim is to provide a seamless tracking system across different parts of the supply chain with varying levels of IT technological capabilities. The open platform is also the basis for future deployment of new technologies that are independent of the existing physical infrastructure within existing supply chains.

Bio: Prof. John Mo obtained his PhD from Loughborough University in Manufacturing Engineering. He is currently Discipline Head of Manufacturing and Materials Engineering at RMIT University. His group covers areas in manufacturing, materials science, sustainable systems, supply chain, mechatronics, autonomous systems. Prior to joining RMIT, John is Team Leader in the Division of Manufacturing and Infrastructure Technology, CSIRO, Australia. In the 11 years in CSIRO, he led several large scale international projects involving multi-disciplinary teams in the development of advanced manufacturing systems and the integration of manufacturing and supply chain.

10.30am-11.15am

Session name: Invited Talk 2B: Towards Continental-Scale Tracking of Flying Foxes

Speaker: Dr. Raja Jurdak, CSIRO, Australia

Towards Continental-Scale Tracking of Flying Foxes

Long-term outdoor localisation with battery-powered devices remains an unsolved challenge, mainly due to the high energy consumption of GPS modules. The use of inertial sensors and short-range radio can reduce reliance on GPS to prolong the operational lifetime of tracking devices, but they only provide coarse-grained control over GPS activity. An alternative yet promising approach is to use context-sensitive mobility models to guide scheduling and sampling decisions in localisation algorithms. In this talk, I will present our work towards continental-scale long-term tracking of flying foxes, as part of the National Flying Fox Monitoring Program, using a model-driven approach. At the core of our approach is the multimodal GPS-enabled Camazotz sensor node platform that has been designed at CSIRO for flying fox collars, with a cumulative weight of below 30g. The talk will cover our recent experience with trialling these platforms in the field on live flying foxes to collect multimodal sensor data for developing models of their mobility. I will also discuss the road ahead for designing adaptive model-driven algorithms for energy-efficient localisation

Bio: Dr. Raja Jurdak is a Principal Research Scientist and leads the Pervasive Computing Group at CSIRO ICT Centre. He received the B.E. degree from the American University of Beirut in 2000, and the MSc and Ph.D. degrees from the University of California Irvine in 2001 and 2005 respectively. He also holds an Adjunct Associate Professor position at the University of Queensland.

He has over 60 peer-reviewed journal and conference papers, as well as a book published by Springer titled: "Wireless Ad Hoc and Sensor Networks: A Cross-layer Design Perspective". He received the CSIRO Medal for Environmental Achievement in 2011, and has won the Endeavour Executive Award in the same year. His current research interests are around mobile sensor networks.

10.30am-11.15am

Session name: Invited Talk 2C: Technology is the Answer. But what is the Question?

Speaker: Andrew Wisdom, Distilled Wisdom, Australia

Technology is the Answer. But what is the Question?

In 1966, visionary British architect Cedric Price captured the topsy-turvy nature of technological change with the title of this presentation, yet this apparently nonsensical observation reflects the risk that innovation in any field - technological no less than any other - in the absence of a sense of purpose risks aimlessness and irrelevance.

Technology has always been both an idea and a thing. Technology shapes how we live now; the unfettered promise of what technology can deliver also shapes our conception of how we can live in the future. Through history, cities and ways of living have been shaped by technology; and change in our physical environment and the way we interact with it has been shaped by technological change. Since electricity was first reticulated through cities, it has not only fomented change, but has invited people to dream of what could be done with it. This impulse carries on today. The idea of sensors and what we might do with them drives us to think how we might do things differently and better.

"Better" is a loaded word: what exactly does better mean? And, importantly, how should this inform our research agendas? Embedded in this appropriately technical programme, I will invite you to reflect on what technology is for, why we innovate and what you can do about it.

Bio: Andrew Wisdom is an urban strategist who identifies unconventional ways to address urban challenges. He is an insightful thinker and motivating speaker on urban issues. Andrew maintains his own practice,

having worked for global consultants Arup for a number of years and in a number of cities around the world. A civil engineer and transport planner by training, he has spent many years addressing the various physical, operational, organisational and behavioural dimensions of city operations and development.

Andrew is a member of the editorial board for the ARRB journal and is a regular contributor to online magazine UBM Future Cities.

Parallel Session 4

Session Name: 4A - RFID Workshop 1 (4 papers)

11:15am-11:35am

An Active Source Validation Scheme Based on Path Identifier

Lin Chen (National University of Defense Technology, China); Ming He (National University of Defense Technology, China)

11:35am-11:55am

Traffic Aware Fuzzy-Tuned Delay Range for Wireless Body Area Networks Medium Access Control Protocol (MAC)

Nesa Mouzehkesh (Charles Sturt University, Australia); Tanveer Zia (Charles Sturt University, Australia); Saman Shafigh (Charles Sturt University, Australia)

11:55am-12:15pm

Wireless Accelerometer Sensor Data Filtering Using Recursive Least Squares Adaptive Filter

Saman Shafigh (Charles Sturt University, Australia); Tanveer Zia (Charles Sturt University, Australia); Nesa Mouzehkesh (Charles Sturt University, Australia)

12:15pm-12:35pm

Framework and Authentication Protocols for Smartphone, NFC, and RFID in Retail Transactions

Pascal Urien (Télécom ParisTech, France); Selwyn Piramuthu (University of Florida, USA)

Session Name: 4B - WSN Energy Efficiency (4 Papers)

11:15am-11:35am

Improving Fountain Codes for Short Message Lengths by Adding Memory

Xiaohan Wang (University of Canterbury, New Zealand); Andreas Willig (University of Canterbury, New Zealand); Graeme Woodward (University of Canterbury, New Zealand)

11:35am-11:55am

A Reliable and Energy-Efficient Chain-Cluster Based Routing Protocol for Wireless Sensor Networks

Zahra Taghikhaki (University of Twente, The Netherlands); Nirvana Meratnia (University of Twente, The Netherlands); Paul J.M. Havinga (University of Twente, The Netherlands)

11:55am-12:15pm

An Interactive Context-Aware Power Management Technique for Optimizing Sensor Network Lifetime

Jinseok Yang (University of California at San Diego, USA); Sameer Tilak (University of California at San Diego, USA); Tajana S. Rosing (University of California at San Diego, USA)

12:15pm-12:35pm

An Energy Efficient Image Compression and Transmission in Wireless Sensor Networks

Duc Minh Pham (University of South Australia, Australia); Syed Mahfuzul Aziz (University of South Australia, Australia)

Session Name: 4C - Information Processing 4 (4 papers)

11:15am-11:35am

Frequency Estimation for 3D Atmospheric Tomography Using Unmanned Aerial Vehicles

Kevin J. Rogers (University of South Australia, Australia); Anthony Finn (University of South Australia, Australia)

11:35am-11:55am

A Coordinate-Free, Decentralized Algorithm for Monitoring Events Occurring to Peaks in a Dynamic Scalar Field

Myeong-Hun Jeong (University of Melbourne, Australia); Matt Duckham (University of Melbourne, Australia)

11:55am-12:15pm

Finding Frequently Visited Paths: Dealing with the Uncertainty of Spatio-Temporal Mobility Data

Mitra Baratchi (University of Twente, The Netherlands); Nirvana Meratnia (University of Twente, The Netherlands); Paul J.M. Havinga (University of Twente, The Netherlands)

12:15pm-12:35pm

K-Coverage in Regular Deterministic Sensor Deployments

Parvin Asadzadeh Birjandi (University of Melbourne, Australia); Lars Kulik (University of Melbourne, Australia); Egemen Tanin (University of Melbourne, Australia)

12.35pm-1.30pm: Lunch

1.30pm-2.30pm

Session name: Plenary 4: Smart Secure Infrastructure

Speaker: Prof. Jay Guo, CSIRO, Australia

Smart Secure Infrastructure

Bio: Prof. Yingjie Jay Guo is an internationally recognised R&D leader with proven track record, a well established scientist with over 250 publications and expertise in antennas and wireless communications systems, and an innovator with strong industrial impact. He is the recipient of Australia Government Engineering Innovation Award (2012), Australia Engineering Excellence Award (2007) and CSIRO Chairman's Medal (2007 & 2012). Jay has over twenty years of international industrial and academic experience across three continents. Currently, he is the Leader of the Smart and Secure Infrastructure research theme in CSIRO's Digital Productivity and Services National Flagship, Australia, and the Director of Australia China Research Centre for Wireless Communications. He is responsible for CSIRO's strategic planning, direction setting and the delivery of programs and projects in the fields of broadband and wireless communications systems and networks, broadband services, smart homes and community, cloud computing and cyber security. Until January 2010, Jay served as the Director of the Wireless Technologies Laboratory in CSIRO ICT Centre. Under his leadership, the team has made significant achievements in science, technology and commercialisation and won numerous international, national and CSIRO top awards. Their major technology breakthroughs include the award-winning world-first 6Gbits/s millimetre-wave system, the most spectrally efficient 600Mbits/s multiple input and multiple output (MIMO) technology, reconfigurable antennas and wide-band array, and the development of a world-leading platform for wireless positioning.

In his role as a theme leader, Jay created the high profile Ngara program within his portfolio, and led it to a great success. In 2009, the program was rewarded \$10M additional funding. In 2012, the team delivered a ground breaking 10Gbps Ngara microwave backhaul, and the most spectrally efficient multi-user MIMO (MU-MIMO) system. It won the most prestigious CSIRO Chairman's Medal, Australia Engineering Innovation Award, and two Engineering Excellence Awards. The technology generated is currently being commercialised to industry. Other cutting edge projects Jay is working on include super-sensitive receivers using high temperature super-conducting devices and E-band adaptive antenna arrays.

In March 2009, Jay established the Australia China Research Centre for Wireless Communications. This is a collaboration led by CSIRO and Beijing University of Posts and Telecommunications (BUPT), and funded by the Australian Department of Innovation, Industry, Science and Research (DIISR) and the Chinese Ministry of Science and Technology (MOST). In November 2009, he initiated the Australia China ICT Summit as Executive Chair.

Prior to joining CSIRO in August 2005, Jay held a number of senior positions in the European mobile communications industry. Between 2000 and 2005, he served as the Manager of Strategic Planning and Manager of System Strategy, respectively, at Mobisphere Ltd, a Siemens and NEC joint venture for the development of the third generation (3G) mobile communications infrastructure. He was responsible for Future Technology and Product Roadmap, Advanced Product Development, and Project and Product Planning. From 1997 to 2000, Jay led the development of advanced technologies for 3G base stations at Fujitsu Europe Telecom R& D Centre, U.K. He played key roles in a number of projects including smart antennas and interference cancellers, and high data rate packet transmission technologies. He was Fujitsu's representative in the 3G standardisation body, 3GPP, and a steering committee member of the UK Virtual Centre of Excellence in mobile communications (Mobile VCE).

Prior to joining Fujitsu, Jay was a Senior Fellow at the University of Bradford, England, where he supervised over twenty researchers on CDMA cellular systems, wireless local area networks (WLAN), signal processing as well as antennas and propagation.

Jay has published 3 books, and over 200 papers in top-tier science and engineering journals and at international conferences on antennas and propagation, microwave theory and techniques, mobile and wireless communications, radio positioning systems and networks, and mm-wave imaging. He holds 18 patents. He is regarded as a world-leading expert of Fresnel zone antennas, reconfigurable antennas, wireless positioning and gigabit wireless systems. He has served as chairs in numerous international and national conference committees. Jay is a Fellow of IET, an Adjunct Professor at University of New South Wales (UNSW), Macquarie University, University of Canberra, and a Guest Professor at the Institute of Computing Technology

and Shanghai Institute of Microsystems and Information Technologies, both of Chinese Academy of Sciences, and Shanghai Jiaotong University.

Parallel Session 5

Session Name: 5A - RFID Workshop 2 (3 papers)

2:30pm-2:50pm

Real-Time Gradient Cost Establishment (RT-GRACE) for an Energy-Aware Routing in Wireless Sensor Networks

Najmul Hassan (Mohammad Ali Jinnah University, Pakistan); Noor M. Khan (Mohammad Ali Jinnah University, Pakistan); Ghufran Ahmed (Mohammad Ali Jinnah University, Pakistan); Rodica Ramer (University of New South Wales, Australia)

2:50pm-3:10pm

Efficient and Secure Data Aggregation for Smart Metering Networks

Muhammad Daniel Hafiz Abdullah (Victoria University of Wellington, New Zealand); Ian Welch (Victoria University of Wellington, New Zealand); Winston K.G. Seah (Victoria University of Wellington, New Zealand)

3:10pm-3:30pm

Internet Smart Card for Perishable Food Cold Supply Chain

Pascal Urien (Télécom ParisTech, France); Selwyn Piramuthu (University of Florida, USA)

Session Name: 5B - Special Session on Internet of Things for Smart Cities (3 Papers)

2:30pm-2:50pm

Building a Generic Architecture for the Internet of Things

Wei Wang (Murdoch University, Australia); Kevin Lee (Murdoch University, Australia); David Murray (Murdoch University, Australia)

2:50pm-3:10pm

An Internet-of-Things System Architecture Based on Services and Events

Shiddartha Raj Bhandari (University of Queensland, Australia); Neil W. Bergmann (University of Queensland, Australia)

3:10pm-3:30pm

Quality of Service for Video Streaming Over Multi-Hop Wireless Networks: Admission Control Approach Based on Analytical Capacity Estimation

Yuwei Xu (University of Otago, New Zealand); Jeremiah D. Deng (University of Otago, New Zealand); Mariusz Nowostawski (University of Otago, New Zealand)

Session Name: 5C - Special Session on Biomedical Sensors and Point of Care Devices for Health Monitoring (3 papers)

2:30pm-2:50pm

The Effect of Tissues in Galvanic Coupling Intrabody Communication

Behailu Kibret (Victoria University, Australia); MirHojjat Seyedi (Victoria University, Australia); Daniel T.H. Lai (Victoria University, Australia); Michael Faulkner (Victoria University, Australia)

2:50pm-3:10pm

The Effect of Walking Surface on Upper Limb Dynamics Measured Using Inertial Sensors

Gita Pendharkar (Monash University, Australia); Daniel T.H. Lai (Victoria University, Australia); Rezaul Begg (Victoria University, Australia)

3:10pm-3:30pm

Characterizing Respiratory Waveform Regularity and Associated Thoraco-Abdominal Asynchrony During Sleep Using Respiratory Inductive Plethysmography

Sarah A. Immanuel (University of Adelaide, Australia); Yvonne Pamula (Women's and Children's Hospital, Australia); Mark Kohler (University of South Australia, Australia); David A. Saint (University of Adelaide, Australia); Mathias Baumert (University of Adelaide, Australia)

3.30pm- 4.00pm: Coffee Break

Poster Session (3:30pm-5:30pm)

- [1]. **Extracting Controllable Heating Loads from Aggregated Smart Meter Data Using Clustering and Predictive Modelling**
Harri Niska (University of Eastern Finland, Finland)
- [2]. **Prolonging the Lifetime of Wireless Sensor Networks Using Light-Weight Forecasting Algorithms**
Femi A. Aderohunmu (University of Otago, New Zealand); Giacomo Paci (Università di Bologna, Italy); Davide Brunelli (Università di Trento, Italy); Jeremiah D. Deng (University of Otago, New Zealand); Luca Benini (Università di Bologna, Italy)
- [3]. **Enhanced De La Garza Routing Algorithm for Wireless Sensor Networks**
Jun-Yun Zheng (National Chung Cheng University, Taiwan); Ren-Song Ko (National Chung Cheng University, Taiwan)
- [4]. **An Automated Segmentation Technique for the Processing of Foot Ultrasound Images**
Rucha Deshpande (VIT University, India); Rajkumar Elagiri Ramalingam (VIT University, India); Nachiappan Chockalingam (Staffordshire University, UK); Roozbeh Naemi (Staffordshire University, UK); Helen Branthwaite (Staffordshire University, UK); Lakshmi Sundar (AR Hospitals, India)
- [5]. **Random Node Sampling for Energy Efficient Data Collection in Wireless Sensor Networks**
M. Baqer (University of Bahrain, Bahrain); Khalid Al Mutawah (University of Bahrain, Bahrain)
- [6]. **A Real-Time Routing Protocol for (m,k)-Firm Streams in Wireless Sensor Networks**
Bijun Li (Gyeongsang National University, Korea); Ki-Il Kim (GyeongSang National University, Korea)
- [7]. **A Hybrid History Based Weighted Voting Algorithm for Smart Mobile E-Health Monitoring Systems**
Ahmed Alahmadi (La Trobe University, Australia); Ben Soh (La Trobe University, Australia); Saleh Alghamdi (RMIT University, Australia)
- [8]. **Dynamic Configuration of Sensors Using Mobile Sensor Hub in Internet of Things Paradigm**
Charith Perera (CSIRO, Australia); Prem Prakash Jayaraman (CSIRO, Australia); Arkady Zaslavsky (CSIRO, Australia); Peter Christen (Australian National University, Australia); Dimitrios Georgakopoulos (CSIRO, Australia)
- [9]. **Charge Selection Algorithms for Maximizing Sensor Network Life with UAV-Based Limited Wireless Recharging**
Jennifer Johnson (University of the Pacific, USA); Elizabeth Basha (University of the Pacific, USA); Carrick Detweiler (University of Nebraska-Lincoln, USA)
- [10]. **Interactive Browsing System for Anomaly Video Surveillance**
Tien-Vu Nguyen (Deakin University, Australia); Dinh Phung (Deakin University, Australia); Sunil Gupta (Deakin University, Australia); Svetha Venkatesh (Deakin University, Australia)
- [11]. **A High Sensitivity Nanorelay Based C-P sensor for Biomedical Implants**
Satish B. Subramanyam (RNSIT, India); Shuddhodhan Shetty (RNSIT, India)
- [12]. **Towards a New Volcano Monitoring System Using Wireless Sensor Networks**
Román Lara (Escuela Politecnica del Ejercito, Ecuador); Antonio Caamaño (Universidad Rey Juan Carlos, Spain); Marco Zennaro (ICTP, Italy); José Luis Rojo (Universidad Rey Juan Carlos, Spain)
- [13]. **Fault Classification and Model Learning from Sensory Readings - Framework for Fault Tolerance in Wireless Sensor Networks**
Valentina Baljak (University of Tokyo, Japan); Kenji Tei (NII, Japan); Shinichi Honiden (University of Tokyo, Japan)
- [14]. **Intra-Cavity Absorption Sensor Based on Erbium-Doped Fiber Laser**
Ying Lu (Tianjin University, China); Baoqun Wu (Tianjin University, China); Xiaohui Huang (Tianjin University, China); Liangcheng Duan (Tianjin University, China); Congjing Hao (Tianjin University, China); Mayilamu Musideke (Tianjin University, China); Jianquan Yao (Tianjin University, China)
- [15]. **Relative and Cardinal Directions for Privacy-aware Personal Navigation Services: A Comparison Towards Navigation Efficiency**
Melissa Shahrom (University of Melbourne, Australia)
- [16]. **PIMU: A Wireless Pressure-Sensing IMU**
Rolf Adelsberger (ETH Zürich, Switzerland); Gerhard Tröster (ETH Zürich, Switzerland)

- [17]. **Maximal Clique Based Clustering Scheme for Wireless Sensor Networks**
Kamanashis Biswas (Griffith University, Australia); Vallipuram Muthukkumarasamy (Griffith University, Australia); Elankayer Sithirasanen (Griffith University, Australia)
- [18]. **Sensor Cooperation in Wireless Body Area Network Using Network Coding for Sleep Apnoea Monitoring System**
Abdur Rahim (Monash University, Australia); Nemaï Chandra Karmakar (Monash University, Australia)
- [19]. **Dynamic Annotation and Visualisation of the South Esk Hydrological Sensor Web**
Ritaban Dutta (CSIRO, Australia); Daniel V. Smith (CSIRO, Australia); Greg Timms (CSIRO, Australia)
- [20]. **An Energy-Efficient Adaptive Sampling Scheme for Wireless Sensor Networks**
Alireza Masoum (University of Twente, The Netherlands); Nirvana Meratnia (University of Twente, The Netherlands); Paul J.M. Havinga (University of Twente, The Netherlands)
- [21]. **Indoor Navigational Aid Using Active RFID and QR-Code for sighted and Blind People**
Saleh Alghamdi (RMIT University, Australia); Ron van Schyndel (RMIT University, Australia); Ahmed Alahmadi (La Trobe University, Australia)
- [22]. **Performance Evaluation of Random Set Based Pedestrian Tracking Algorithms**
Branko Ristic (DSTO, Australia); Jamie Sherrah (DSTO, Australia); Ángel F. García-Fernández (Chalmers University of Technology, Sweden)
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5.30pm: Program Closes

7.00pm: Conference Dinner

5th April, 2013 – Friday

8.30 am - 5:00 pm: Registration

9.00am-10.00am

Session name: Plenary 5: Lensfree On-Chip Microscopy and Tomography Toward Telemedicine Applications

Speaker: Prof. Aydogan Ozcan, UCLA, USA

Lensfree On-Chip Microscopy and Tomography Toward Telemedicine Applications

Today there are more than 5 billion cell-phone users in the world, and the majority of these cellphones are being used in the developing parts of the world. This massive volume of wireless phone communication brings an enormous cost-reduction to cellphones despite their sophisticated hardware and software capabilities. Utilizing this advanced state of the art of the cell phone technology towards point-of-care diagnostics and/or microscopic imaging applications can offer numerous opportunities to improve health care especially in the developing world where medical facilities and infrastructure are extremely limited or even do not exist.

Centered on this vision, in this talk I will introduce new imaging and detection architectures that can compensate in the digital domain for the lack of complexity of optical components by use of novel theories and numerical algorithms to address the immediate needs and requirements of Telemedicine for Global Health Problems. Specifically, I will present an on-chip cytometry and microscopy platform that utilizes cost-effective and compact components to enable digital recognition and 3D microscopic imaging of cells with sub-cellular resolution over a large field of view without the need for any lenses, bulky optical components or coherent sources such as lasers. This incoherent holographic imaging and diagnostic modality has orders of magnitude improved light collection efficiency and is robust to misalignments which eliminates potential imaging artifacts or the need for realignment, making it highly suitable for field use. Applications of this lensfree on-chip microscopy platform to high-throughput imaging and automated counting of whole blood cells, monitoring of HIV+ patients (through CD4 and CD8 T cell counting) and detection of waterborne parasites towards rapid screening of water quality will also be demonstrated. Further, I will discuss lensfree implementations of various other computational imaging modalities on the same platform such as pixel super-resolution imaging, lensfree on-chip tomography, holographic opto-fluidic microscopy/tomography. Finally, I will demonstrate lensfree on-chip imaging of fluorescently labeled cells over an ultra wide field of view of >8 cm², which could be especially important for rare cell analysis (e.g., detection of circulating tumor cells), as well as for high-throughput screening of DNA/protein micro-arrays.

Bio: Prof. Aydogan Ozcan received his Ph.D. degree at Stanford University Electrical Engineering Department. After a short post-doctoral fellowship at Stanford University, he is appointed as a research faculty at Harvard Medical School, Wellman Center for Photomedicine in 2006. Dr. Ozcan joined UCLA in the summer of 2007, where he is currently an Associate Professor leading the Bio- and Nano-Photonics Laboratory at the Electrical Engineering and Bioengineering Departments.

Prof. Ozcan holds 22 issued patents (all of which are licensed) and more than 15 pending patent applications for his inventions in nanoscopy, wide-field imaging, lensless imaging, nonlinear optics, fiber optics, and optical coherence tomography. Dr. Ozcan gave more than 130 invited talks and is also the author of one book, the co-author of more than 260 peer reviewed research articles in major scientific journals and conferences. In addition, Dr. Ozcan is the founder and a member of the Board of Directors of Holomic LLC.

Prof. Ozcan received several major awards including the 2011 Presidential Early Career Award for Scientists and Engineers (PECASE), which is the highest honor bestowed by the United States government on science and engineering professionals in the early stages of their independent research careers. Dr. Ozcan received this prestigious award for developing innovative optical technologies and signal processing approaches that have the potential to make a significant impact in biological science and medicine; addressing public health needs in less developed countries; and service to the optical science community including mentoring and support for underserved minority undergraduate and graduate students. Dr. Ozcan also received the 2013 SPIE BioPhotonics Technology Innovator Award, the 2011 Army Research Office (ARO) Young Investigator Award, 2011 SPIE Early Career Achievement Award, the 2010 NSF CAREER Award, the 2009 NIH Director's New

Innovator Award, the 2009 Office of Naval Research (ONR) Young Investigator Award, the 2009 IEEE Photonics Society (LEOS) Young Investigator Award and the MIT's Technology Review TR35 Award for his seminal contributions to near-field and on-chip imaging, and telemedicine based diagnostics.

Prof. Ozcan is also the recipient of the 2012 Popular Science Brilliant 10 Award, 2012 National Academy of Engineering (NAE) The Grainger Foundation Frontiers of Engineering Award, 2011 Innovators Challenge Award presented by the Rockefeller Foundation and mHealth Alliance, the 2010 National Geographic Emerging Explorer Award, the 2010 Bill & Melinda Gates Foundation Grand Challenges Award, the 2010 Popular Mechanics Breakthrough Award, the 2010 Netexplorateur Award given by the Netexplorateur Observatory & Forum in France, the 2011 Regional Health Care Innovation Challenge Award given by The von Liebig Center at UCSD, the 2010 PopTech Science and Public Leaders Fellowship, the 2009 Wireless Innovation Award organized by the Vodafone Americas Foundation as well as the 2008 Okawa Foundation Award, given by the Okawa Foundation in Japan.

Prof. Ozcan was selected as one of the top 10 innovators by the U.S. Department of State, USAID, NASA, and NIKE as part of the LAUNCH: Health Forum organized in 2010. He also received the 2012 World Technology Award on Health and Medicine, which is presented by the World Technology Network in association with TIME, CNN, AAAS, Science, Technology Review, Fortune, Kurzweil and Accelerosity.

Dr. Ozcan is elected Fellow of SPIE, and is a Senior Member of IEEE, a Member of LEOS, EMBS, OSA, and BMES.

10.00am- 10.30am: Coffee Break

10.30am-11.15am

Session name: Invited Talk 3A: Intelligent Optical Fibre Based Perimeter Security Systems

Speaker: Dr. Jim Katsifolis, Future Fibre Technologies, Australia

Intelligent Optical Fibre Based Perimeter Security Systems

The success of any perimeter security system depends on two critical performance parameters: Its probability of detection (POD) and its nuisance alarm rate (NAR). The use of fibre optic sensing technologies in perimeter security systems is approaching a stage of maturity with a number of commercialised technologies now being used in a broad range of applications and installations covering a wide range of environmental conditions. These technologies offer very high sensitivities and long distance distributed sensing capabilities which makes them susceptible to unwanted environmental nuisance alarms that can render a system unusable. In this talk, the importance of using intelligent signal processing techniques to overcome the challenge of nuisance alarms while maintaining an acceptable POD will be presented with some real life examples.

Bio: Dr. Jim Katsifolis is the Chief Technology Officer and VP of Technical Operations at Future Fibre Technologies (FFT). He has a PhD in photonics from La Trobe University, Masters of Science in Astronomy from Swinburne, as well as Masters and Bachelors of Engineering degrees from RMIT. Jim has 20 years of experience in both fibre optic communications and fibre optic sensing technologies beginning his career as an academic at La Trobe University (1993 - 1998), after which he briefly joined FFT in 1998. He then joined VPI Systems Inc. in 1999 taking up the roles of Technical Liaison Manager and then Software Development Team Leader. In 2004 he re-joined FFT where he has held the roles of Senior Fibre Systems Engineer and Product Development Manager, before taking up the roles of CTO and VP Technical Operations.

Jim has been instrumental in the development and patenting of many of FFT's unique technologies and is responsible for leading the company's technology strategy, and research and development efforts. He is also a Member of the IEEE and a Graduate Member of the Australian Institute of Engineers (IEAust).

10.30am-11.15am

Session name: Invited Talk 3B: Three-Dimensional Thin Film Li-ion Batteries for Miniaturized Power Sources

Speaker: Prof. Menachem Nathan, Tel Aviv University, Israel

Three-Dimensional Thin Film Li-ion Batteries for Miniaturized Power Sources

Microsystems in general and smart sensors in particular need miniaturized power sources. The most established and in some cases the only power sources available are batteries. The smallest commercial "microbatteries" are either conventional button-type, or recently developed two-dimensional thin film batteries (2D-TFBs). The first are still too large and bulky for many applications, while the 2D-TFBs have very small energy/capacity and power per footprint.

The talk will present and discuss the performance of a new rechargeable thin-film battery technology developed over the past decade at Tel Aviv University. This technology is particularly useful for powering sensors in wireless sensor networks as well as miniaturized and implantable medical devices. The technology employs wet chemistry to form three-dimensional (3D) TFBs in silicon and other substrates. In a comparison study performed with a commercial solar energy harvesting development kit, the 3D TFBs exhibit an order of magnitude higher energy and power per footprint than the state-of-the-art 2D TFBs included in the kit. The combination of high energy and high power is unique and unavailable from any other known power source of small dimensions.

Bio: Menachem Nathan is a Professor of Electrical Engineering at Tel Aviv University (TAU) Israel. He received his PhD in materials science from Cornell University, USA, and his BSc and MSc degrees from the Technion in Haifa, Israel. Before joining TAU, he was a postdoctoral fellow at IBM Research, Yorktown Heights, NY and a Senior Scientist at Martin Marietta Laboratories, Baltimore, MD. His research at TAU has been focused on semiconductors, micro-systems (MEMS and MOEMS), nano-optical sensors, thin film battery (TFB) technologies and spectral imaging. In particular, he is a lead inventor on a 3D-TFB technology developed in cooperation with a group in the School of Chemistry at TAU. This technology is currently the only technology that can provide truly miniaturized power sources for use in sensor networks, medical devices and other applications.

Prof. Nathan is a co-author of ca. 100 publications and holds 31 patents. As a patent agent, he drafted and prosecuted more than 250 patents applications before the USPTO and other patent offices.

10.30am-11.15am

Session name: Invited Talk 3C: Connecting Government-Centric Applications Through a Unified Sensing and Sense-Making Architecture

Speaker: Dr. Hwee-Pink Tan, Institute for Infocomm Research (I²R), A*STAR, Singapore

Connecting Government-Centric Applications Through a Unified Sensing and Sense-Making Architecture

Increased urbanization is putting a strain on land resources and quality of life. As cities and roads become more congested, urban solutions are required to provide real-time information about the environment in order for various government agencies to make informed decisions to provide a safe and clean living environment for city dwellers. Along with the expected demand, sensing systems also need to cater to heterogeneity in terms of sensor modalities, technologies as well as end user and applications.

In this presentation, we will give an overview of A*STAR's Sense and Sense-abilities (S&S) Programme, which envisions to conduct integrative R&D to define the reference architecture for an end-to-end platform for sustainable large scale and heterogeneous 'sensing' and 'making-sense' of our living environment in real time, tested and validated with government agencies as lead users.

Bio: Dr. Hwee-Pink Tan is currently a Senior Scientist at the Institute of Infocomm Research (I²R), A*STAR and is also the Programme Manager for the A*STAR Sense and Sense-abilities Program, where he leads a team of 20 full-time research scientists and engineers. He graduated from the Technion, Israel Institute of Technology, Israel in August 2004 with a Ph.D. In December 2004, he was awarded the A*STAR International Postdoctoral Fellowship. From December 2004 to June 2006, he was a post-doctoral research at EURANDOM, Eindhoven University of Technology, The Netherlands. He was a research fellow with the Centre for Telecommunications Value-chain Research (CTVR), Trinity College Dublin, Ireland between July 2006 and March 2008.

His research has focused on the design, modeling and performance evaluation of networking protocols for wireless networks, and his current research interests include underwater acoustic sensor networks and wireless sensor networks powered by ambient energy harvesting. He has been a Principal Investigator for several industry-projects in the above research areas. He has published more than 60 papers and has served

on the TPC of numerous conferences and reviewer of papers for many key journals and conferences in the area of wireless networks.

Parallel Session 6

Session Name: 6A - Intelligent Sensors - MEMS (4 Papers)

11:15am-11:35am

An Online Load Identification Algorithm for Non-Intrusive Load Monitoring in Homes

Xiaojing Wang (Chongqing University, China); Dongmei Lei (ShenZhen A+E Design Co. Ltd., China); Jing Yong (Chongqing University, China); Liqiang Zeng (Chongqing University, China); Sam West (CSIRO, Australia)

11:35am-11:55am

SA-A-WSN: Situation-Aware Adaptation Approach for Energy Conservation in Wireless Sensor Network

Prem Prakash Jayaraman (CSIRO, Australia); Pari Delir Haghighi (Monash University, Australia)

11:55am-12:15pm

A Wake-Up Switch Using a Piezoelectric Differential Pressure Sensor

Yutaka Tomimatsu (NMEMS Technology Research Organization, Japan); Hidetoshi Takahashi (University of Tokyo, Japan); Takeshi Kobayashi (AIST, Japan); Kiyoshi Matsumoto (University of Tokyo, Japan); Isao Shimoyama (University of Tokyo, Japan); Toshihiro Itoh (AIST, Japan); Ryutaro Maeda (AIST, Japan)

12:15pm-12:35pm

Characterization of a New Flexible Pressure Sensor for Body Sensor Networks

Sravan Salibindla (Victoria University, Australia); Brice Ripoché (Université de Bourgogne, France); Daniel T.H. Lai (Victoria University, Australia); Simon Maas (Racesafe, Australia)

Session Name: 6B - WSN Communication and Networking Protocols (4 Papers)

11:15am-11:35am

CCN-WSN --- A Lightweight, Flexible Content-Centric Networking Protocol for Wireless Sensor Networks

Zhong Ren (Yale University, USA); Mohamed A. Hail (Fachhochschule Lübeck, Germany); Horst Hellbrück (Fachhochschule Lübeck, Germany)

11:35am-11:55am

Performance Sensitivity of Routing Algorithms with Various Models of Wireless Sensor Networks

Julien Bernard (FEMTO-ST, France); Violeta Felea (FEMTO-ST, France)

11:55am-12:15pm

An Empirical Comparison of Limb Joint Effects on Capacitive and Galvanic Coupled Intra-Body Communications

MirHojjat Seyedi (Victoria University, Australia); Behailu Kibret (Victoria University, Australia); Daniel T.H. Lai (Victoria University, Australia); Michael Faulkner (Victoria University, Australia)

12:15pm-12:35pm

Rate Distance and MST-Based Multiratecasting in Wireless Sensor Networks

Xidong Liu (University of Ottawa, Canada); Amiya Nayak (University of Ottawa, Canada); Ivan Stojmenovic (University of Ottawa, Canada)

Session Name: 6C - Information Processing 5 (4 papers)

11:15am-11:35am

IMC-based Feedforward Control of a Piezoelectric Tube Actuator

Morteza Mohammadzahari (University of Adelaide, Australia); Steven Grainger (University of Adelaide, Australia); Mehdi Kasaei Kopaei (University of Adelaide, Australia); Mohsen Bazghaleh (University of Adelaide, Australia)

11:35am-11:55am

Introduction of Electromagnetic Image-Based Chipless RFID System

Mohammad Zomorodi (Monash University, Australia); Nemaï Chandra Karmakar (Monash University, Australia); Shivali Goel Bansal (Monash University, Australia)

11:55am-12:15pm

A Novel Hybrid Approach for Wireless Powering of Biomedical Implants

Mehdi Kasaei Kopaei (University of Adelaide, Australia); Arash Mehdizadeh (University of Adelaide, Australia); Damith C. Ranasinghe (University of Adelaide, Australia); Said Al-Sarawi (University of Adelaide, Australia)

12:15pm-12:35pm

Complementary Resistive Switch (CRS) Based Smart Sensor Search Engine

Sang-Jin Lee (Chungbuk National University, Korea); Kwang-Seok Oh (Chungbuk National University, Korea); Yeon-Gyu Ahn (Chungbuk National University, Korea); Kyoungrok Cho (Chungbuk National University, Korea); Kamran Eshraghian (Chungbuk National University, Korea)

12.35pm- 1.30pm: Lunch

1.30pm-2.30pm

Session name: Plenary 6: From Poor Multi-Binary Sensors to Rich Environmental Sensing

Speaker: Prof. Paulo de Souza, University of Tasmania, Australia

From Poor Multi-Binary Sensors to Rich Environmental Sensing

Today's sensors are highly reliable but comparatively bulky with high-power requirements and high-cost. The future trend is to go with sensors that are easy to deploy, simple to gather data from, extremely power-efficient, low-cost and produced in thousands. However, the data produced by those tiny sensors could be poorer. In an extreme case, these sensors will communicate using binary states representing the change through thresholds (i.e., multi-binary, quantum levels). Although poor in quality, a sword of binary sensors would provide an extraordinary image of the entire network landscape. Like a cloud of gas, we would not see individual particles, but rather the whole system or ensemble. Thermodynamic and quantum mechanical formalisms are examples of theoretical approaches that can be used to extract parameters from an entire system, rather than for each individual particle or sensor - this will change the way we observe natural systems.

This talk will introduce you to the concept of binary sensing and present some theoretical formalism used to interpret their data. It will illustrate their potential relevance to environmental sensing, modeling and ultimately to the understanding of nature.

Bio: Paulo de Souza is Professor of Sensor Informatics with the University of Tasmania and Office of the Chief Executive (OCE) Science Leader at CSIRO. He is a visiting Professor and Head of Environmental Monitoring with Vale Institute of Technology. Prof Paulo de Souza received his Ph.D. degree in 2004 from the Johannes Gutenberg Universität in Mainz, Germany. He is recognised internationally in field robotics, geochemistry, and environmental engineering. He is a collaborating scientist on NASA's Mars Exploration Rover mission, which landed and operates two large robots, Spirit and Opportunity, on the surface of Mars. Paulo is co-author of over 200 peer-review papers, including the Breakthrough of the Year in 2004 by Science Magazine.

As an OCE Science Leader, he is responsible for fostering the development of CSIRO's smart sensor network research which aims to create technologies that will radically reduce the cost of gathering data while improving its quality, thus enhancing understanding of the environment and improving management of Australia's natural resources.

Parallel Session 7

Session Name: 7A - Sensor Fusion and Tracking 2 (3 Papers)

2:30pm-2:50pm

Square-Root Unscented Filtering and Smoothing Mark G. Rutten (DSTO, Australia)

2:50pm-3:10pm

Bernoulli Filter for Detection and Tracking of an Extended Object in Clutter

Branko Ristic (DSTO, Australia); Jamie Sherrah
(DSTO, Australia)

3:10pm-3:30pm

Multi-Bernoulli Sensor Control for Multi-Target Tracking

Amirali Khodadadian Gostar (RMIT University,
Australia); Reza Hoseinnezhad (RMIT University,
Australia); Alireza Bab-Hadiashar (RMIT University,
Australia)

Session Name: 7B - WSN Coverage and Storage (3 Papers)

2:30pm-2:50pm

A Distributed Protocol for Storage Aggregation in Wireless Sensor Networks

Yakov Nae (UNICAMP, Brazil)

2:50pm-3:10pm

Priority-Based Coverage Path Planning for Aerial Wireless Sensor Networks

Ghulam Murtaza (University of New South Wales,
Australia); Salil Kanhere (University of New South
Wales, Australia); Sanjay Jha (University of New
South Wales, Australia)

3:10pm-3:30pm

3.30pm- 4.00pm: Coffee Break

4.00pm-5.00pm

Session name: Concluding Plenary: Large Scale Anomaly Detection in Video Streams

Speaker: Prof. Svetha Venkatesh, Deakin University, Australia

Large Scale Anomaly Detection in Video Streams

This talk addresses a major challenge in large-scale data mining applications where the full information about the underlying processes cannot be practically obtained due to physical limitations such as low bandwidth, limited memory, storage, or computing power. Motivated by the recent theory on direct information sampling called compressed sensing (CS), we propose a framework for detecting anomalies from these large-scale data mining applications where the full information is not practically possible to obtain. Our theoretical contribution shows that the spectral property of the compressible data is approximately preserved under a CS projection and thus the performance of spectral-based methods for anomalies detection is almost equivalent to the case in which the raw data were completely available. Our second contribution is the construction of the framework to use this result and detect anomalies in the CS data directly, thus circumventing the problems of data acquisition of large sensor networks. Our results show that our proposed method is scalable, and importantly, its performance is comparable to conventional methods

Hull-Based Approximation to Forest Fires with Distributed Wireless Sensor Networks

M. Ángeles Serna (Universidad de Castilla-La
Mancha, Spain); Aurelio Bermúdez (Universidad de
Castilla-La Mancha, Spain); Rafael Casado
(Universidad de Castilla-La Mancha, Spain)

Session Name: 7C - Information Processing 6 (3 papers)

2:30pm-2:50pm

Towards a Secure Electricity

Mike Burmester (Florida State University, USA);
Joshua Lawrence (Florida State University, USA);
David Guidry (Florida State University, USA); Sean
Easton (Florida State University, USA);
Sereyvathana Ty (Sandia National Laboratories,
USA); Xiuwen Liu (Florida State University, USA);
Xin Yuan (Florida State University, USA); Jonathan
Jenkins (Florida State University, USA)

2:50pm-3:10pm

OMTDR Using BER Estimation for Ambiguities Cancellation in Ramified Networks Diagnosis

Wafa Ben Hassen (LFSE/LIST/CEA, France); Fabrice
Auzanneau (LFSE/LIST/CEA, France); Luca
Incarbone (LFSE/LIST/CEA, France); François Pères
(LGP/ENIT, France); Ayeley P. Tchangani
(LGP/ENIT, France)

3:10pm-3:30pm

Fuzzy Logic Inspired Bearing Fault-Model Membership Estimation

Muhammad Amar (Monash University, Australia);
Iqbal Gondal (Monash University, Australia);
Campbell Wilson (Monash University, Australia)

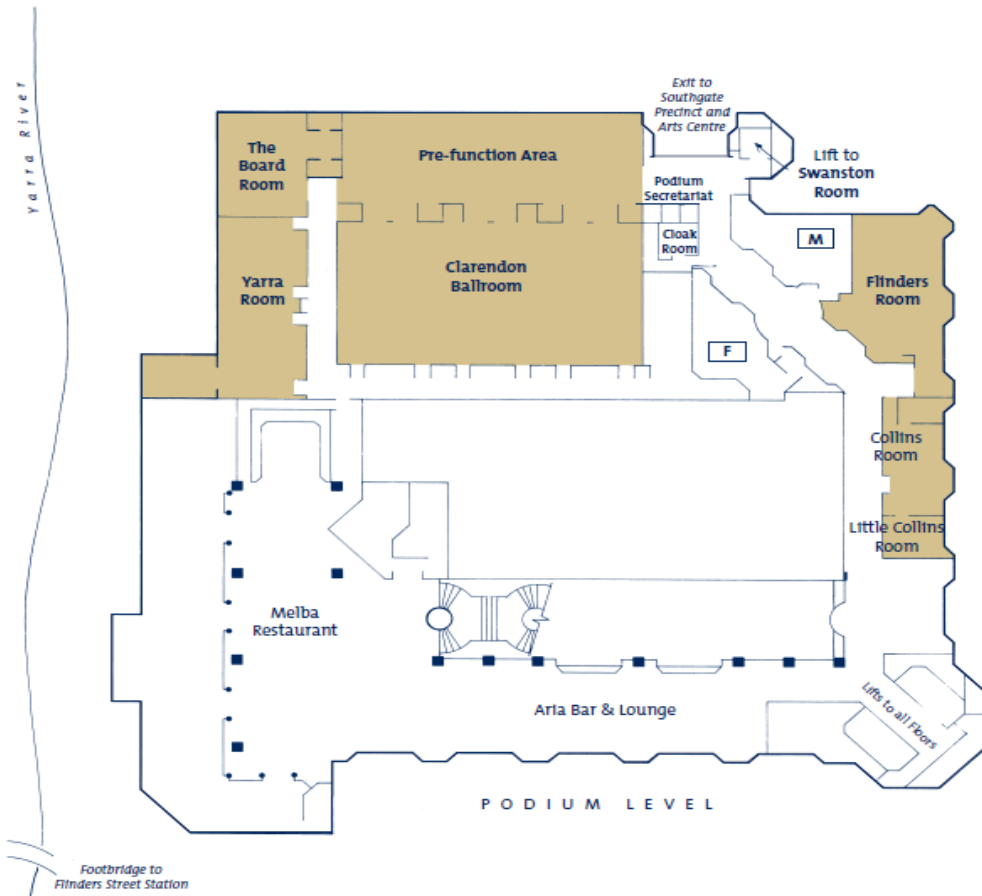
for anomaly detection when the complete data is available. The result of this work is a startup company iCetana - winner of the Broadband innovation award at Tech23.

Bio: Venkatesh is Alfred Deakin Professor and Director of Centre for Pattern Recognition and Data Analytics (PRaDA) at Deakin University. Venkatesh was elected a Fellow of the International Association of Pattern Recognition in 2004 for contributions to formulation and extraction of semantics in multimedia data. She is a Fellow of the Australian Academy of Technological Sciences and Engineering. She is on the editorial board of IEEE Transactions on Multimedia and was on the board of ACM Transactions on Multimedia (2008-2011). She is a program member of several international conferences such as ACM Multimedia. Venkatesh has developed frontier technologies in large scale pattern recognition exemplified through 416 publications. She has won over \$14 million in competitive research funding since 1992. Venkatesh and her colleagues have filed 9 patents, of which 3 are full patents. One start-up company, spun out of these patents is Virtual Observer and based on the paradigm shifting methods that leverages mobile cameras to deliver wide area surveillance solutions. The technology won the Runner up in both the WA Inventor of the year (Early stage) and Global Security Challenge (Asia-Pacific) in 2007. A recent spin-out company is iCetana and is based on novel methods to find anomalies in video data. iCetana won the Broadband Innovation Award at the prestigious Tech23 in 2010.

Concluding Remarks

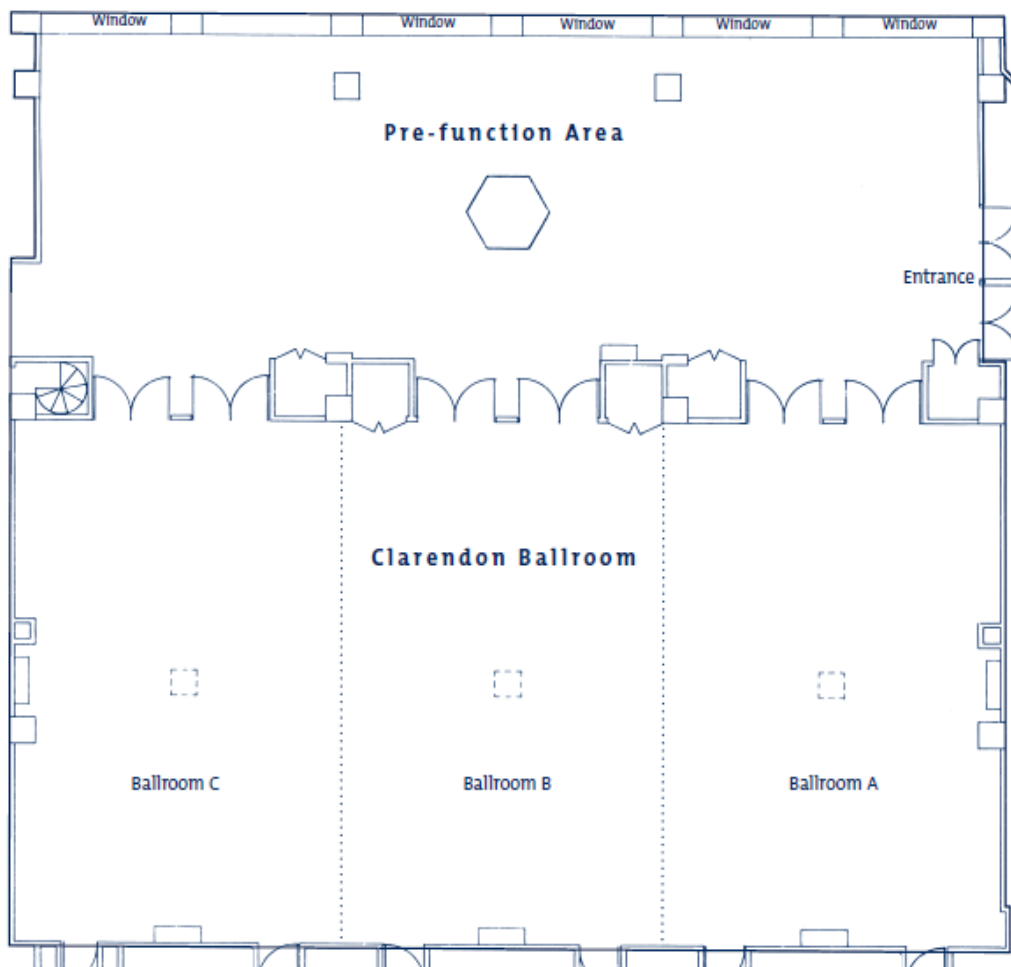


THE LANGHAM HOTEL
Melbourne

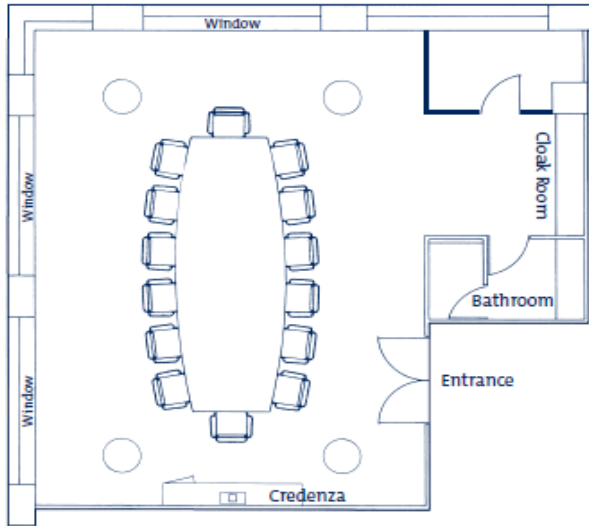


CLARENDON BALLROOM

The CLARENDON BALLROOM
is located on Podium Level



THE BOARDROOM



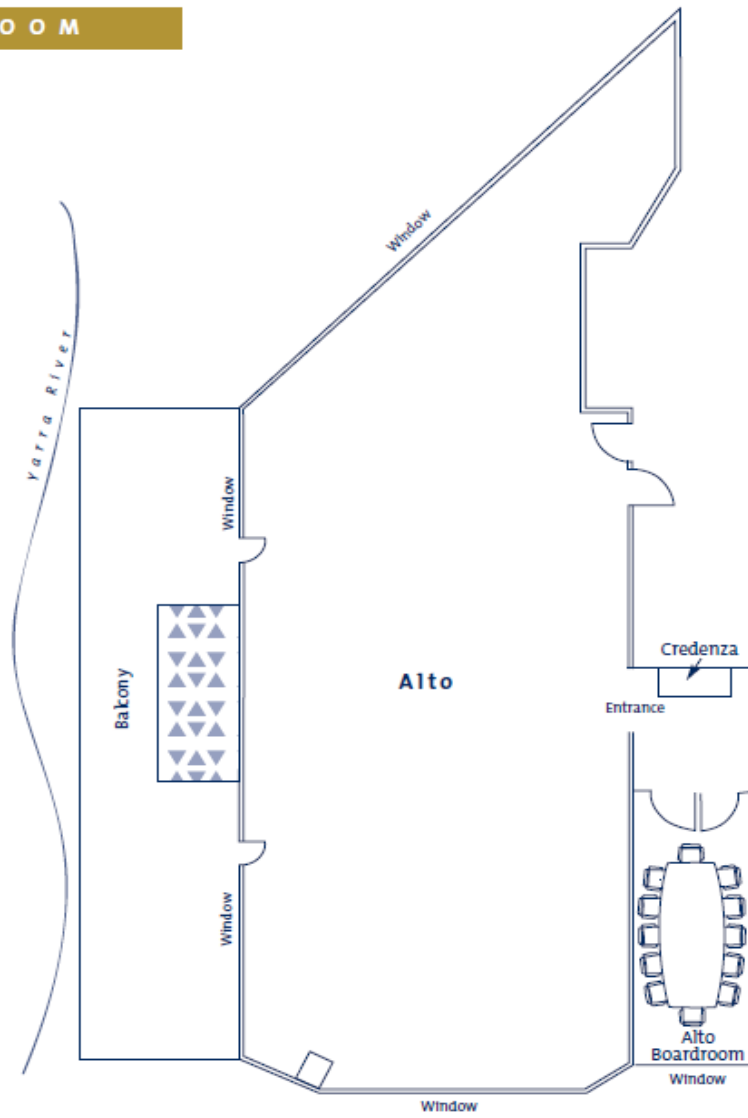
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and YARRA ROOM
are located on
Podium Level

YARRA ROOM

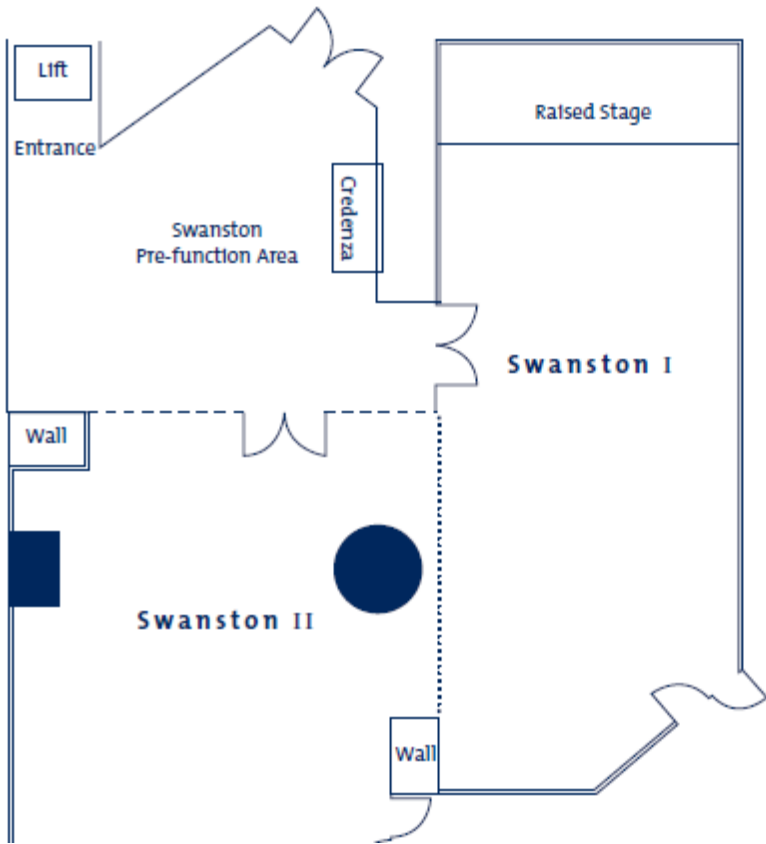


ALTO ROOM

ALTO is located
on Level 25



SWANSTON ROOM



The SWANSTON ROOM is located on the Lower Ground Level and the TOWERS ROOMS are located on Level 9