Conference Program

IEEE-ICM 2017

2017 IEEE International Conference on Mechatronics (ICM)

Federation University Australia
Gippsland Campus
13-15 February 2017

Sponsored by the

The Institute of Electrical and Electronics Engineers (IEEE)
IEEE Industrial Electronics Society (IES)

Co-sponsored by:

The Institute of Electrical Engineers Japan (IEEJ)
Society of Instrument and Control Engineers (SICE-Japan)
IEEE Robotics and Automation Society (RAS)
Federation University Australia

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General Co-Chairs Welcome Message

Dear Participants of the International Conference on Industrial Technology,

On behalf of the Industrial Electronics Society (IES) of the Institute of Electrical and Electronics Engineers (IEEE), the main sponsor of this prestigious International event, and on behalf of the conference's various committees it is our pleasure and honour to welcome you to IEEE-ICM 2017.

A few challenges are facing our world today such as climate change, energy and food shortages. The conference committee of this event saw fit that IEEE International Conference on Mechatronics should respond to current world concerns. Rural and Regional industry play important part in the economy of many countries and in supplying the world with food and other resources. On the other hand, globalization and world market economy intensified the urge to develop and adopt new technology. Technology development and adoption, usually, set the upper limit for maintaining the competitiveness and sustainability of many regional industries.
For this reason, the theme of this conference was designed to be on:

Advanced Mechatronics in Service of Regional Industry

This conference is also designed not only to be intellectually stimulating but also socially enjoyable. The social activities of this conference were designed to allow for adequate delegates interaction to meet old friends and make new ones. I trust you will be inspired by the beauty of our region and enjoy the Australian cultural programs that have been prepared for you.

We also wish to acknowledge the dedicated work of the conference Technical Program Co-chairs and the contribution of the technical track chairs for managing the timely reviews of the technical papers. We extend are sincere thanks for the many reviewers who volunteered their time and efforts for upholding the quality of this conference. We wish to acknowledge, in particular, the great work done by the Local Organising Committee and the contribution and support of Latrobe City since the inception of hosting this International conference in Gippsland. The support of AGL, Loy Yang, is greatly acknowledged.

To all the conference participants we extend our sincere welcome and wish you a fruitful and enjoyable stay in Australia.

Yousef Ibrahim
General Co-Chair, Australia

Kouhei Ohnishi
General Co-Chair, Japan

Technical Program Chairs Welcome Message

The ICM-2017 Technical Program committee is delighted to present a stirring technical program on the campus of Federation University, February 13-15. Program highlights include:

- 14 technical sessions covering a broad spectrum of mechatronics topics:
  - advanced vehicle technologies
  - robotics and motion control
  - sensors and actuators
  - cyberphysical systems
  - industrial automation
  - mechatronics education
- 1 mini-workshop (Tuesday morning)
- 1 industry forum (Tuesday morning)
- 3 keynote presentations (Monday, Tuesday, Wednesday mornings)

Nearly 80 carefully selected presentations, representing all regions of the world, are in the 3-day technical program. The 3 keynote presentations also offer unique global perspectives of mechatronics advances and future directions.

The Tuesday morning mini-workshop is open to everyone, and offers in-depth study of how mechatronics join and interact with humans to assist in the medical and rehabilitation fields. At the same time, the perspective of local industry will be presented and discussed in the Industry Forum.

Technical sessions have been arranged to minimize time overlaps, so conference attendees are able to sample and explore ideas from all sessions. Attendees will have generous time to develop enduring collaborations and technical discussions during each day's break times (morning and afternoon), as well as the lunch breaks.

The ICM-2017 technical program joins an excellent social and cultural program that has been crafted by the General Chairs. We look forward to meeting and engaging with many attendees throughout the meeting days.

Sincerely,
Technical Program Co-Chairs

Ren Luo
Taiwan

Hideki Hashimoto
Japan

John Hung
USA

Conference Committees

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Helen McLean

Information for Delegates

VENUE
Federation University Australia, Gippsland Campus
Northways Road, Churchill
Victoria 3842, Australia
Conference Secretariat: +61 419 805362 or +61 409 350708

VENUE LOCATION
The main conference venue for the IEEE-ICM'17 Conference on "Advanced Mechatronics in Service of Regional Industry" is Federation University, Gippsland campus, which is located at Churchill, in the heart of Gippsland. The secretariat Desk and Speakers Room are located at the campus, and this will be the venue for plenary sessions, morning/afternoon teas, lunches and technical sessions.

REGISTRATION
The Conference Secretariat and Registration Desk will be located at the Gippsland campus in the foyer of the auditorium.
Registration times are as follows:
Monday 13 February 8.00am onward
Tuesday 14 February 8.00am onward
Wednesday 15 February 8.00am onward
Delegate bags and conference materials are available at the registration desk at the times indicated above.

TRANSPORT FROM GIPPSLAND ACCOMMODATION TO CONFERENCE VENUE
Delegates will be picked up from their hotel each morning and taken to the conference venue. At the conclusion of each conference day delegates will be returned to their hotel or taken to a Social Event.

WELCOME RECEPTION – Monday 13 February - 6:00 pm - 8:00 pm
Old Gippstown – you will be transported by coach from the conference venue to the reception. You will step back in time as you wander through the streets of this quaint little town, and then treated to a light meal.

CONFERENCE DINNER – Tuesday 14 February – 7.00pm – 11.00pm
Bonnie Brae Homestead – you will be transported to your hotel and picked up again by coach to the dinner venue. The conference dinner venue itself provides a fabulous view of Gippsland at night and you will get to meet some amazing Aussie animals. The evening includes a 3 course dinner with beverages, entertainment and dancing…not to be missed

CONFERENCE TOUR – Wednesday 15 February – 4.30pm – 11pm
This tour is included in the full registration fee. Your coach will depart from the conference venue and you will see some lovely scenery as we wind our way through magnificent countryside as we drive to Philip Island. On arrival you will be taken to a restaurant to enjoy a light dinner before we make our way down to the Penguin Parade. You will be amazed as you watch the tiny Fairy Penguins make their way from the beach to their nests. Please ensure you have comfortable walking shoes and warm clothing for this tour as it may become quite cold in the evening.

CONFERENCE PROGRAM

At the Conference, a bulletin board, located next to the Conference secretariat, will display any changes to the program or news about special events.

CONFERENCE PROCEEDINGS
The proceedings of the conference will be made available on a USB.

INTERNET CONNECTION

Delegates will have complimentary internet access provided throughout the conference venue. Please see Bulletin Board beside the Secretariat Desk for account details and wireless connection instructions.

AUTHOR INFORMATION
In general, each oral presentation will be allocated a time slot of 20 minutes, including questions and handovers. Your presentation must be no more than 15 minutes in order to allow for questions and discussion, and handover and next speaker set-up. The session chairs will be instructed to terminate overrunning presentations in order to ensure that every presenter has the same amount of time. In special sessions and/or plenary presentations, the length of the time slots may vary.
We ask that you send through your presentation via **DropBox**, advising us at email: helen@caseyconferenceservices.com.au **also bring it with you on a USB.**

On the day of your presentation
Presenters/Speakers should **report at the registration desk well before the start of their session.**
Presenters/Speakers will then be directed to where an audio visual technician will load your presentation onto the computer and check, well ahead of the start of the session that all is in order, working etc.

Presenters/Speakers are required to meet the Session Chairs, at least at the break prior to their presentation to receive instructions from Session Chairs. The presenters are encouraged to remain in the session room from start to end, in case the delegates would like to discuss with the presenter's additional points after the session.

Some Guidelines for preparing your presentation
Make sure that your slides are readable, i.e. when preparing your presentation, use sufficiently large font sizes (at least 20 pt), and avoid colour combinations with poor contrast. Pay special attention to diagrams and graphics so that they appear readable. Presentations should be either in Microsoft PowerPoint™ or Adobe PDF™ format.

PLENARY SESSIONS
All keynote addresses will take place in 2E – 101. A complete list of plenary sessions will be included in the conference program which will be distributed on-site.

PRESENTATION SESSIONS
Sessions will vary in time and number of presentations. Paper presentations have been allocated 15 min per presentation + 5 min Q & A.

MESSAGES
Messages for delegates will be left on the bulletin board located at the Secretariat Desk. Contact event management on +61 419 805362 or +61 409 350708. Delegates are advised to consult the message board during conference breaks.

CATERING
Morning, afternoon teas and lunches will be provided during the conferenced. Conference Reception, Conference Dinner and the trip to Philip Island are included in full registration.

INCIDENTAL EXPENSES
The Conference Organisers or the Conference Organising Group will not be responsible for any incidental expenses incurred by delegates during the conference.

CLIMATE AND CLOTHING
With its variable climate, Melbourne is warm to hot during summer, with temperatures averaging 28C during the day and 16C at night. It is recommended that visitors bring clothing suitable for warm days and cool nights.

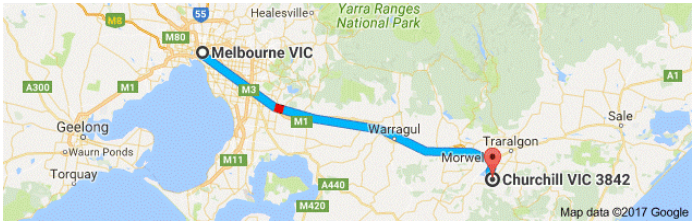
SMOKING
Smoking of tobacco products **is banned** on public transport and in all publicly accessible buildings, including hotels, restaurants, theaters and the **Conference Venue** and **university grounds.**

Registration Desk staff and volunteers will be on hand to answer questions and provide you with conference-related assistance on site.

Program At a Glance

Time	Room					
	2E-101			2E-201		
	Monday	Tuesday	Wednesday	Monday	Tuesday	Wednesday
9:00:00 AM	opening	Keynote Address (Prof John Hung)	Keynote Address (Prof Kouhei Ohnishi)			
9:10:00 AM						
9:20:00 AM						
9:30:00 AM	Keynote Address (Prof Ren Luo)					
9:40:00 AM						
9:50:00 AM						
10:00:00 AM		Coffee (3E)	Coffee (3E)		Coffee (3E)	Coffee (3E)
10:10:00 AM						
10:20:00 AM		Mini-Workshop: Human-assist Approach for Medicine, Rehabilitation, and Care by Mechatronic Aid	Robotics & Motion Control VII / Industry Visit (AGL, Loy Yang)		Industry Forum	Mechatrics in Tertiary Education & Cyber-Physical System / Industry Visit (AGL, Loy Yang)
10:30:00 AM	Coffee (3E)			Coffee (3E)		
10:40:00 AM						
10:50:00 AM	Sensors and Actuators I			SS1: Innovative Vehicle Technologies		
11:00:00 AM						
11:10:00 AM						
11:20:00 AM						
11:30:00 AM						
11:40:00 AM						
11:50:00 AM						
12:00:00 PM						
12:10:00 PM						
12:20:00 PM		Lunch/ Plenary Talk (LC) (AUDITORIUM, 3-E)	Lunch (AUDITORIUM, 3-E)		Lunch/ Plenary Talk (LC) (AUDITORIUM, 3-E)	Lunch (AUDITORIUM, 3-E)
12:30:00 PM	Lunch (Rose Garden)			Lunch (Rose Garden)		
12:40:00 PM						
12:50:00 PM						
1:00:00 PM						
1:10:00 PM						
1:20:00 PM						
1:30:00 PM	Sensors and Actuators II	Robotics & Motion Control IV / Industry Visit (AGL, Loy Yang)	Autonomous and Cyber-Physical Systems	Robotics & Motion Control I	Robotics & Motion Control V / Industry Visit (AGL, Loy Yang)	Industrial Automation
1:40:00 PM						
1:50:00 PM						
2:00:00 PM						
2:10:00 PM						
2:20:00 PM						
2:30:00 PM						
2:40:00 PM						
2:50:00 PM						
3:00:00 PM						
3:10:00 PM	Coffee (3E)			Coffee (3E)		
3:20:00 PM		Coffee (3E)			Coffee (3E)	
3:30:00 PM	Robotics & Motion Control III	SS2: Balancing cost, risk and performance in Mechatronics Systems	Coffee (3E)	(Robotics & Motion Control II	Robotics & Motion Control VI	Coffee (3E)
3:40:00 PM						
3:50:00 PM						
4:00:00 PM						
4:10:00 PM			Travel for a light Dinner and to Penguin Parade in Philip Island			Travel for a light Dinner and to Penguin Parade in Philip Island
4:20:00 PM						
4:30:00 PM						
4:40:00 PM						
4:50:00 PM						
5:00:00 PM		Back to Hotels & travel to Gala Dinner Venue			Back to Hotels & travel to Gala Dinner Venue	
5:10:00 PM	Travel to historic Old GippsTown for Welcome Reception			Travel to historic Old GippsTown for Welcome Reception		
5:20:00 PM						
5:30:00 PM						
5:40:00 PM						
5:50:00 PM						

Latrobe City - Gippsland



Campus Map


Gippsland Campus, Churchill | Map
To Monash Way
McDonald Way
Merv Grant Bruce Dve
To Golf Course
GIPPSLAND ENTERPRISE CENTRE
9N
SPORTING FIELD
7N
NORTH PLACE
3N
1E
LIBRARY
3E
2E
AUDITORIUM
4N
5N
2N
LINK
1E
KNUCKLE
6N
5N
5W
2W
1W
1N
AMPITHEATRE
THEATRE
LC
LEISURE CENTRE
Northways Road
6W
3W
MAIN ENTRANCE
1S
2S
4W
West Residential Hall A
WHA
WHB
West Residential Hall B
To Shopping Centre
Ada Crossley Drive
5S
SWITCHBACK GALLERY
6S
West Res
STUDENT ACCOMMODATION
South Res
STUDENT ACCOMMODATION
WEST REC. HALL
SOUTH REC. HALL
Lawless Road
Legend
Buildings
Roads
Car Park Number (Restrictions may apply)
Disability Car Spaces
Pathway/Route
Toilet facilities are available in most buildings, refer building signage.
Lift
Bike Parking
Bus Stop
Parents Room
Health Centre
Food and Drink
Designated Assembly Point
Spiritual Centre
Rest Room
For security assistance call 5122 6662
For disability access assistance call 5122 6662
For Mobility Access Map refer Page 3
All Federation University Australia Campuses are Smoke-free

Keynote Speakers

Dr. Ren C. Luo

Dr. Ren C. Luo received both Dipl.-Ing, and Dr.-Ing. Degree in EE from the Technische Universitaet Berlin, Germany. He is currently a Chief Technology Officer of ASUS COMPUTER INC. and Chair and Life Distinguished Professor at National Taiwan University. He served two terms as President of National Chung Cheng University in Taiwan and Founding President of Robotics Society of Taiwan. He was an Assistant, Associate Professor and tenure Full Professor of Department of Elec and Computer Eng. and University of North Carolina System Director of Robotics and Intelligent Machines Research

Center at North Carolina State University, Raleigh, NC, USA and Toshiba Chair Professor at University of Tokyo, Japan.

His research interests include sensors and control systems for intelligent robotics, multi-sensor fusion and integration, computer vision, 3D printing manufacturing technologies. He has authored more than 450 papers on these topics, which have been published in refereed international journals and refereed conference proceedings. He also holds more than 25 international patents. Dr. Luo received IEEE Eugean Mittleman Outstanding Research Achievement Award, IEEE IROS Harashima Innovative Technologies Award; ALCOA Company Foundation Outstanding Engineering Research Award, USA; Ministry of Science and Technology Outstanding Research Awards, and Ministry of Science and Technology Distinguished Research Awards; TECO Company Outstanding Science and Technology Research Achievement Award in Taiwan. Dr. Luo is currently serving as Editor-in-Chief of the IEEE Transactions on Industrial Informatics (Impact Factor 4.70), he was also Co-Editor-in-Chief of IEEE Transactions on Industrial Electronics (Impact Factor 6.50) and served 5 years as Editor-in-Chief of IEEE/ASME Transactions on Mechatronics (Impact Factor 3.75). From 2000-2001 he served as President of IEEE Industrial Electronics Society. He also served as a President of Chinese Institute of Automation Engineers, Program Director of Automation Technology Division, Ministry of Science and Technology; Adviser to the Ministry of Economics Affairs and Science and Technology Adviser for the Prime Minister in Taiwan.

In addition to his contributions to the various academic, industrial and governmental professional services in Taiwan, Dr. Luo has also served as a referee and as a final review panel member for numerous international organizations and countries, such as USA, European Union, Austria, Swiss, Japan, Canada, Australia, Singapore, Hong Kong etc. for the evaluation and assessment of national competitive grants program in major cross-disciplinary research projects in the field of intelligent robotics and automation, mechatronics and advanced manufacturing systems. Dr. Luo is a Fellow of IEEE and a Fellow of IET.

Keynote Address

Industry 4.0 as the Best Practice of Intelligent mechatronics:
From the Vision to Realization towards Innovation Economy

Abstract

Germany has established sustainable leading Industry 4.0 vision with cyber physical system (CPS) as the core technology which integrates computation, communication and control technologies along with intelligent robotics, internet of things, big dada and cloud computing.
It intends to solve problems for industrial production needs on exceeded orders , excess inventory or less as well as not timed production. It is expected to enhance their international competitiveness, and create high added value of high pay job opportunities. In this talk, issues and approaches of the core spirits of the fourth industrial revolution and its relevance with intelligent mechatronics will be addressed. The impact to the future of design innovation and service innovation resulting from CPS system and robot-integrated manufacturing automation will also be presented.

Professor John Hung

John Y. Hung is Professor of Electrical & Computer Engineering at Auburn University, USA, where he engages people with general concepts from nonlinear systems and control. Recent applications include navigation and control of autonomous vehicles, robotics, power electronics, and electric machines. A Fellow of IEEE and past-President of the IEEE Industrial Electronics Society, he also serves on the IEEE Board of Directors (2017-2018), representing the seven technical societies in Division VI. Prior to his academic career, John worked in the motion control and building automation control fields. He earned his B.S. (1979, University of Tennessee), M.E.E. (1981, Princeton University), and Ph.D (1989, University of Illinois, Urbana-Champaign) all in electrical engineering. He has numerous hobbies, but his inabilities to either sing or dance continue to be personal frustrations. John and his wife Diana are the happy parents of three grown children, all married.

Keynote Address

Mechatronics as Platforms for Sensor Systems

Abstract

Sensor systems have long been key enablers for high performance mechatronic systems. Advances in transducers and signal processing have made possible high precision, high accuracy, high dynamic, and even nature-mimicing motions by mechatronic systems. We are now seeing a growing role reversal, however, as mechatronics are becoming platforms for sensor systems whose primary purpose may not be control of the mechatronic system itself. Rather, modern mechatronic systems are now carrying, manipulating, and moving sensors that measure, probe, and characterize the world around us. In this presentation, several recent examples where mechatronics and their sensor payloads demonstrate an increasingly symbiotic relationship. In each case, a mechatronic system enables the sensor system to be moved in such a way that the environment can be measured more accurately. At the same time, measurement of the environment is helping the mechatronic system improve its own motion control. The first example will involve electromagnetic pulse sensors for geophysical surveys, and the second example involves the use of radio frequency identification tags for retail merchandise surveys.

Dr. Kouhei Ohnishi

Dr. Kouhei Ohnishi B.E. (1975), M.E. (1977) and Ph.D.(1980) all in electrical engineering from the University of Tokyo. Since 1980, he has been with Keio University, and is Professor at Dept. of System Design Engineering. He has been active in the IEEE IES for long time. He served as a President (2008- 2009) for IES. He also served as a President at the Institute of Electrical Engineers of Japan (IEEJ 2015-2016). He has been a fellow of IEEE since 2001, a fellow of IEEJ since 2011 and a fellow of the Japan Society of Mechanical Engineering since 2002. He received numerous awards including the IEEE IES Eugene Mittelman Achievement Award.

Keynote Address

Soft Robotics - A Key Concept of Mechatronics

Abstract

We can immediately know what the object is when we touch it.

If the object is soft, it must be a sponge (or similar thing).

If it is rigid, it may be a metal block. That sensation is an ability of the human being called “haptic sense”.

“Real-haptics” is a technology to reconstruct haptic sense by acquiring dynamic physical information that is transferred bi-directionally between the surrounding environment and the human. An abandonment of haptics causes difficulty in further advance in mechatronics area, or may even result in threatening the safety and security of the process.

In fact, the area of mechatronics has lacked this concept for long time. Soft robotics is a realization of new concept coming from real haptics. This gives not only compliant motion but also skillful motion to the robot and/or mechatronics.

In the presentation the structure of soft robotics using a newly developed “haptic core-chip”. Also the talk will introduce various applications by visual demonstrations.

Industry Forum Speakers

Carl Liersch

Biography:

Carl is a mechanical engineer and project manager who has worked for Bosch for over 26 years, including 6 of those years in various roles in Germany.

He has played a pivotal role in introducing ABS, Airbags and ESC technology to Australia through the local vehicle manufacturers, and moved into a management role with Bosch in 2005.

During his career with Bosch, Carl has worked on safety system projects for Ford, GM Holden, Mitsubishi and Toyota in Australia, for Jaguar and Ford in Europe, and Toyota in Japan. His team has also supported many other international projects that include China, Japan, USA, Malaysia and India.

His current activities with Bosch include supporting and promoting the introduction to Australia of Advanced Driver Assistance Systems leading to Automated Driving, and Intelligent Transport Systems.

Carl was also responsible for the level 3 Highly Automated Driving demonstration around Albert Park Lake during the ITS World Congress in Melbourne in October 2016.

Speech Title:

Automated Vehicles Supporting "Towards Zero Accidents" Initiative.

How hard can it be?

Summary:

Many of us talk about a future where there are zero accidents and all vehicles are automated or driverless. It sounds attractive but how easy is it to automate a vehicle that is suitable for all driving conditions? What are the considerations we must engineer into such a vehicle?

The technology challenges are split between a range of sensors, various actuators, complex electrical architecture, intuitive human machine interface, and external connectivity. Tying all of these together is software which must conform to the standards of ISO26262 and ASPICE, which sets a high standard for verification and validation. On top of this are the usual legal issues that come with releases for on-road testing.

This presentation discusses some of the technology we have used in our highly automated driving (HAD) vehicle, and gives an insight into many of the challenges that are being confronted by Bosch in our drive towards achieving a zero accident future.

Mark Hodge

Biography:

Dr Mark Hodge has served as Chief Executive Officer of DMTC Limited since its inception in June 2008, overseeing the organisation's success in a range of Defence activities and its transition to a sustainable industry capability partner under the 2016 Defence Industry Policy Statement.

He is a passionate advocate for science and technology in the defence of Australia and its national interests and has worked in the defence and aerospace fields for his entire professional career.

Dr Hodge is Chair of the City of Latrobe Economic Development Panel, Board Member of the Sir Lawrence Wackett Aerospace Centre (RMIT University) and Advisory Committee Member of the ARC Centre of Excellence for Advanced Framework Materials. He is a former Director and Deputy Chair of the CRC Association and interim CEO of the Innovative Manufacturing CRC.

From 2005 to 2008, Mark was Chief Executive of Australian Aerospace and Defence Innovations Ltd (AADI) where he regularly engaged international and Australian defence sector stakeholders. Prior to AADI, Dr Hodge led the Victorian Government's commercialisation team in developing a new technology commercialisation support program. He spent five years as senior engineer and Director of research and development for METSS Corporation, a private defence-sector technology development company in the United States and has lectured in materials technology and mechanical engineering at Monash and Victoria Universities respectively.

Mark holds PhD and Honours Engineering Degrees from Monash University and Executive Business Administration qualifications from Ohio State University in the United States.

Mark is the author of several research publications, holds four patents on advanced defence materials and is the recipient of a number of industry and research-sector awards. He is a fellow of The Academy of Technical Science and Engineering.

Speech Title:

Defence Manufacturing: Mechatronics and Robotics case studies

Summary:

Like many industry sectors, Defence is a highly demanding sector, requiring global best practice performance and productivity matched with careful cost controls and value for money provisions as key drivers in the sector. Australia's entry into the active phase of the most significant defence

acquisitions in history, in terms of value and engineering complexity has coincided with an increased focus on the role of local industry as a significant enabler of defence capability, with industry enshrined as a Fundamental Input to Capability in the 2016 Defence Industry Policy Statement.

As defence platforms increase in complexity, prime contractors are increasingly reaching out to best practice industrial capabilities across the globe and the opportunity for industry to participate in a range of high value local and global supply chains has never been more evident. Successful supply chain participants, both large and small companies, are increasingly turning to enabling capabilities such as mechatronics, automation and digital manufacturing as a means of delivering the demonstrated best-practice capability and transformational improvements in quality, quantity, repeatability and customisation necessary to break into and consolidate positions in defence supply chains.

Australian manufacturing is currently undergoing critical transformations in this regard. A summary of sector opportunities and success stories, including a number of case studies in the Australian defence sector underpinned by mechatronics and mechatronics-related technologies, will be presented for discussion.

Doug Smith

Biography:

Doug Smith's first involvement with robots was back in 1980 with the installations of Unimation and Kawasaki - Unimate Robots in the Automotive arena. In 1986, Doug established Robot Technologies-Systems Australia Pty Ltd (RTA). RTA remains an Australian-owned private company and is Australia's foremost integrator of robotic automation systems, with over thirty years of experience and expertise in industrial robotics, manufacturing automation, process automation and factory automation.

As a founding member of the Australian Robotics and Automation Association (ARAA), from the Industry's early inception Doug has been instrumental in raising the profile of robotics automation industry within Australia.

Speech Title:

Case study - Multi-process welding robot cuts weld time by up to 90 percent

Summary:

Automation of manufacturing is the lifeline for Australian industries to survive in the highly competitive global market. This presentation provides a case study on automation of maintenance, emergency repair and rebuild workshop in Central Queensland. In desire to make this large welding workshop more efficient, BOC and its integrator partner Robot Technologies-Systems Australia Pty Ltd (RTA) supplied and installed a unique robot welding system for adaptive maintenance welding of heavy mining buckets and dump truck bodies.

To minimise programming time, RTA developed world leading technology to convert encoded data from a DXF file into data that allows the robot to scan and weld any type of weld geometry. After the 'teach' process, the robot locates the piece in envelop and then uses the laser camera to scan the part and build weld paths based on data in the DXF file.

Since installing the welding robot, the welding time was reduced by 70 to 90 percent. It has also reduced overall production costs, improved safety, quality and reporting, and broadened its range of work scope capabilities. The robot has also eliminated the risks of fatigue, heat stress and working height restrictions, minimising risk of human injury and the need for ergonomic access planning. Commercially, it has boosted overall productivity, while reducing labour and associated personal protective equipment (PPE) costs.

Session & Paper Index

Monday 13th of February

CE - Open Ceremony

LectTheatre 1 - 2E-101, Monday 13th of February, 09:00

CE - Industry 4.0 as the Best Practice of Intelligent mechatronics: From the Vision to Realization towards Innovation Economy

LectTheatre 1 - 2E-101, Monday 13th of February, 09:30
Keynote Addresser: Prof. Ren C. Luo
Presenter: Prof John Hung

Abstract - Germany has established sustainable leading Industry 4.0 vision with cyber physical system (CPS) as the core technology which integrates computation, communication and control technologies along with intelligent robotics, internet of things, big dada and cloud computing. It intends to solve problems for industrial production needs on exceeded orders,excess inventory or less as well as not timed production. It is expected to enhance their international competitiveness, and create high added value of high pay job opportunities. In this talk, issues and approaches of the core spirits of the fourth industrial revolution and its relevance with intelligent mechatronics will be addressed. The impact to the future of design innovation and service innovation resulting from CPS system and robot-integrated manufacturing automation will also be presented.

SENACT I - Sensors and Actuators I

LectTheatre 1 - 2E-101, Monday 13th of February, 10:50
Chair/s: Prof Steven Wilcox, Prof Yutaka Uchimura

Dynamic stiffness enhancement of a flight control actuator using control techniques

Mr. Heric Martinez Santos Ballesteros, Mr. Raphael Das Neves Calvo, Dr. Alberto Adade Filho

Accurate and Versatile Multivariable Arbitrary Piecewise Model Regression of Nonlinear Fluidic Muscle Behavior

Mr. Allan J. Veale, Prof. Sheng Q. Xie, Dr. Iain A. Anderson

Marine Engine Fault Detection System using Networked Proximity Sensors

Mr. Syamsul Rizal, Mr. Hak-Hui Choi, Mr. Seung-Han Kim, Mr. Sung-Hun Kim, Prof. Dong-Seong Kim

FPGA-Based Voltage Control with PDM Inverter for Wideband Drive System Using T-type Neutral-Point-Clamped Topology

Mr. Hiroki Kurumatani, Prof. Seiichiro Katsura

An Innovative Control Strategy for a Hybrid Energy Storage System (HESS)

Mr. Li Sun, Prof. Nong Zhang, Mr. Mohamed Awadallah, Dr. Paul Walker

SS1 - Innovative Vehicle Technologies

LectTheatre 2 - 2E-201, Monday 13th of February, 10:50
Chair/s: Dr Li Sun, Dr Paul Walker

Collaborative Engineering of Integrated Chassis Control for Ground Vehicle: Case Study of Lifelong Learning Technologies in Automotive Mechatronics

Dr. Valentin Ivanov, Prof. Klaus Augsburg, Mr. Dzmitry Savitski, Mr. Viktor Schreiber, Prof. Schalk Els, Mr. Miguel Dhaens

Design Methodology and Experiment on Battery SOC Balance Circuit of HEECS for EV Power Train

Mr. Hiroyuki Kodaira, Mr. Kazuaki Kojima, Dr. Yukinori Tsuruta, Prof. Atsuo Kawamura

Comparison of effect on motor among 2-, 3- and 4-speed transmission in electric vehicle

Mr. Yuhong Fang, Mr. Jiageng Ruan, Dr. Paul Walker, Prof. Nong Zhang

Hierarchical control for automatic braking of vehicle

Mr. Wenfei Li, Mr. Haiping Du, Prof. Weihua Li

Advanced vehicle suspension with variable stiffness and damping MR damper

Mr. Shuaishuai Sun, Mr. Xin Tang, Prof. Weihua Li, Prof. Haiping Du

SENACT 2 - Sensors and Actuators II

LectTheatre 1 - 2E-101, Monday 13th of February, 13:30
Chair/s: Prof Hideki Hashimoto, Prof Jie Li

On the development of a portable, cost effective and compact master/slave system for robot-assisted Minimally Invasive Surgery

Dr. Houssem Saafi, Dr. Amine Laribi, Prof. Said Zeghloul, Prof. Yousef Ibrahim

Tactile Sensor Based Intelligent Grasping System

Mr. Justin Venter, Dr. Abdul Md Mazid

Optimum Grasp Force and Resistance to Slippage

Dr. Pavel Dzitac, Dr. Abdul Md Mazid, Prof. M. Yousef Ibrahim, Dr. Tanveer Choudhury, Dr. Gayan Kahandawa Appuhamillage

Enhancing Solar Power Generation Using Gravity and Fresh Water Pipe

Mr. Muhammad Ismail Bilal Sheikh, Dr. Saad Bin Abul Kashem, Dr. Tanveer Choudhury

Switched Self-Sensing Actuator for a MEMS Nanopositioner

Mr. Steven Moore, Dr. Yuen Kuan Yong, Prof. Reza Moheimani

ROBCON 1 - Robotics & Motion Control I

LectTheatre 2 - 2E-201, Monday 13th of February, 13:30
Chair/s: Prof John Hung, Prof. Kiyoshi Ohishi

Energy Efficient Slope Traversability Planning for Mobile Robot in Loose Soil

Mr. Go Sakayori, Prof. Genya Ishigami

Kinematic Calibration of Industrial Robot by Identification from Relative TCP Deviations during Reorientation Movement

Mr. Bin Niu

Controlled hovering flight of an insect-like tailless flapping-wing micro air vehicle

Mr. Hoang Vu Phan, Prof. Taesam Kang, Prof. Hoon Cheol Park

Adaptive Control of the Translational Oscillator with a Rotational Actuator System

Dr. Yiqing Wang, Dr. Sheng Li

On the Simulation-based Objective Estimation of Road Vehicle Ride Comfort

Mr. Navid Mohajer, Dr. Hamid Abdi, Dr. Kyle Nelson, Prof. Saeid Nahavandi

ROBCON 3 - Robotics & Motion Control III

LectTheatre 1 - 2E-101, Monday 13th of February, 15:30
Chair/s: Prof Dong-Seong Kim, Prof Yucel Aydin

A nonlinear H-infinity control approach for closed-chain robotic mechanisms

Dr. Gerasimos Rigatos, Dr. Pierluigi Siano, Dr. Jorge Pomares

Single Inertialization of a 2-Inertia System Based on Fine Torsional Torque and Sensor-based Resonance Ratio Controllers

Prof. Yuki Yokokura, Prof. Kiyoshi Ohishi

Anti-sway fixed-order control of bridge cranes with varying rope length

Dr. Alberto Luigi Cologni, Dr. Michele Ermidoro, Prof. Simone Formentin, Prof. Fabio Previdi

A Linear Temporal Logic Based Approach To Vehicle Motion Planning

Mr. Dule Shu, Prof. Constantino Lagoa

Sampled-Data Nonlinear Control of a Lotka-Volterra System with Inputs

Dr. Triet Nguyen-Van, Prof. Noriyuki Hori, Prof. Rikiya Abe

ROBCON 2 - Robotics & Motion Control II

LectTheatre 2 - 2E-201, Monday 13th of February, 15:30
Chair/s: Prof. Tomoyuki Shimono, Dr Gayan Appuhamillage

Proposing an adhesion unit for an traveling-wave-type, omnidirectional wall-climbing robot in airplane body inspection applications

Mr. Takafumi Amakawa, Mr. Tomohiro Yamaguchi, Prof. Yasuyuki Yamada, Prof. Taro Nakamura

Visually Servoed Pickup of Moving Objects with a Dynamically Controlled Manipulator

Dr. Kai Wang, Dr. Fuquan Dai

Time Delay Compensation for DOB-Based Contact Force Control under Time Delay

Mr. Tetsuya Tashiro, Prof. Tomoyuki Shimono, Dr. Takahiro Mizoguchi, Prof. Kouhei Ohnishi

Contact Prediction Control for a Tele-operation System with Time Delay

Mr. Hiromu Norizuki, Prof. Yutaka Uchimura

Slip Ratio Control using Load-side High-resolution Encoder for In-wheel-motor with Reduction Gear

Mr. Tomoki Enmei, Prof. Hiroshi Fujimoto, Prof. Yoichi Hori, Dr. Daisuke Gunji, Mr. Kenji Omata

Adaptive Variable Structure Control of Active Magnetic Bearings for Rigid Rotors With Uncertain External Payloads

Dr. Yucel Aydin, Dr. Fuat Gurleyen

Tuesday 14th of February

CE - Mechatronics as Platforms for Sensor Systems

LectTheatre 1 - 2E-101, Tuesday 14th of February, 09:00
Keynote Addresser: Prof John Hung
Presenter: Prof Steven Wilcox

Abstract - Sensor systems have long been key enablers for high performance mechatronic systems. Advances in transducers and signal processing have made possible high precision, high accuracy, high dynamic, and even nature-mimicing motions by mechatronic systems. We are now seeing a growing role reversal, however, as mechatronics are becoming platforms for sensor systems whose primary purpose may not be control of the mechatronic system itself. Rather, modern mechatronic systems are now carrying, manipulating, and moving sensors that measure, probe, and characterize the world around us. In this presentation, several recent examples where mechatronics and their sensor payloads demonstrate an increasingly symbiotic relationship. In each case, a mechatronic system enables the sensor system to be moved in such a way that the environment can be measured more accurately. At the same time, measurement of the environment is helping the mechatronic system improve its own motion control. The first example will involve electromagnetic pulse sensors for geophysical surveys, and the second example involves the use of radio frequency identification tags for retail merchandise surveys.

WS - Mini-Workshop on "Human-assist Approach for Medicine, Rehabilitation, and Care by Mechatronic Aid"

LectTheatre 1 - 2E-101, Tuesday 14th of February, 10:20
Lecturer/s: Prof. K. Ohnishi; Prof. K. Ota, Ms. Tamegai, , Prof. Tomoyuki Shimono

IF - Industry Forum

LectTheatre 2 - 2E-201, Tuesday 14th of February, 10:20
Chair/s: Prof John Hung, Dr Gerasimos Rigatos

ROBCON 4 - Robotics & Motion Control IV / Industry Visit (AGL, Loy Yang)

LectTheatre 1 - 2E-101, Tuesday 14th of February, 13:20
Chair/s: Prof Jie Li, Dr A. Mazid

Development of A Haptic Palpation Device With A Scaling Bilateral Control for The NOTES Surgery

Mr. Kenji Ogawa, Prof. Kouhei Ohnishi

Unbalance Compensation of a Magnetically Levitated Rotor for the Whole Operating Range

Mr. Markus Hutterer, Prof. Manfred Schrödl

Walking Assistance System for Walking Stability by using Human Motion Information

Ms. Seonghye Kim, Mr. Kiichi Hirota, Prof. Takahiro Nozaki, Prof. Toshiyuki Murakami

Force Capability Evaluation Methods for Bilateral Controlled Manipulators

Mr. Hiromu Sekiguchi, Prof. Kouhei Ohnishi

Large Force Scaling Bilateral Control Using Voice Coil Motor with Thrust Compensation

Mr. Daisuke Tomizuka, Prof. Kensuke Oda, Prof. Kouhei Ohnishi

Wearable Finger Exoskeleton using Flexible Actuator for Rehabilitation

Mr. Simon Lemerle, Mr. Satoshi Fukushima, Mr. Yuki Saito, Dr. Takahiro Nozaki, Prof. Kouhei Ohnishi

ROBCON 5 - Robotics & Motion Control V

LectTheatre 2 - 2E-201, Tuesday 14th of February, 13:20
Chair/s: Prof Yousef Ibraim, Dr Gour Karmakar

{Power-Based Pseudo-Symmetry For 4 Channel Bilateral Control Under Time Delay.

Mr. Mehdi Hazaz, Dr. Kouhei Ohnishi

Design and Implementation of Omni-directional Spherical Modular Snake Robot (OSMOS)

Mr. Akash Singh, Mr. Anshul Paigwar, Mr. Sai Teja Manchukanti, Mr. Manish Saroya, Mr. Manish Maurya, Prof. Shital Chiddarwar

Iterative learning of time-optimal trajectories for robotic manipulators

Mr. Armin Steinhauser, Prof. Jan Swevers

Study on Potential Field Based Motion Planning and Control for Automated Vehicle Collision Avoidance Systems

Ms. Nurbaiti Wahid, Dr. Hairi Zamzuri, Dr. Mohd Azizi Abdul Rahman

Evaluation of knotted suture threads from the view point of tension and elongation by using a developed testing machine

Mr. Kensuke Oda, Mr. Hayata Sakai, Prof. Kouhei Ohnishi, Prof. Eiji Kobayashi

Pneumatic position servo control considering the proportional valve zero point

Prof. Hai-Peng Ren, Mrs. Pei-Fen Gong, Mrs. Jie Li

SS2 - SS Balanacing Cost, Risks and Performance in Mechatronics Systems

LectTheatre 1 - 2E-101, Tuesday 14th of February, 15:40
Chair/s: Dr Gopinath Chattopadhyay, Mr Ronald Mead

Development of a Flame Monitoring and Control System for Oxy-Coal Flames

Prof. Steven Wilcox, Mr. Palani Valliappan

Investigation into Maritime Platform Hull Defects Automation of Sensors and Processing

Mr. Ronald F Mead, Dr. Gopinath Chattopadhyay

Dynamically Controlling Exterior and Interior Window Coverings through IoT for Environmental Friendly Smart Homes

Dr. Gour Karmakar, Dr. Gopinath Chattopadhyay, Dr. Zhigang Xiao, Mrs. Soma Roy

Cyber Attacks in Mechatronics Systems Based on Internet of Things

Mr. Abdullahi Chowdhury

ROBCON 6 - Robotics & Motion Control VI

LectTheatre 2 - 2E-201, Tuesday 14th of February, 15:40
Chair/s: Dr Gayan Appuhamillage, Dr Robert Ross

Design and Modeling of an Open Platform for Dynamic Walking Research

Mr. A. Mounir Boudali, Mr. Felix H. Kong, Mr. Javier Martinez, Mr. Justin Z. Tang, Prof. Ian R. Manchester

Modeling and Analysis of a Parallel Continuum Robot Using Artificial Neural Network

Mr. Guanlun Wu, Prof. Guanglin Shi, Mr. Yangle Shi

Transmission quality of bilateral free space optics system

Mr. Yuki Tashiro, Mr. Yosuke Suito, Mr. Yuta Shimada, Prof. Kiyotaka Izumi, Prof. Koichi Yoshida, Prof. Takeshi Tsujimura

Compliance Control for Stabilization of Bilateral Teleoperation System in the Presence of Time Delay

Mr. Hayata Sakai, Prof. Daisuke Tomizuka, Prof. Kouhei Ohnishi

Switching Structure Controller for Plastic Injection Moulding System

Dr. Oleksandr Veligorskyi, Dr. Maksym Khomenko, Prof. Roustiam Chakirov, Dr. Yuriy Vagapov

Wednesday 15th of February

CE - Soft Robotics - A Key Concept of Mechatronics

LectTheatre 1 - 2E-101, Wednesday 15th of February, 09:00
Keynote Addresser: Prof Kouhei Ohnishi
Presenter: Prof Yousef Ibrahim

Abstract - We can immediately know what the object is when we touch it.
If the object is soft, it must be a sponge (or similar thing).
If it is rigid, it may be a metal block. That sensation is an ability of the human being called “haptic sense”.
“Real-haptics” is a technology to reconstruct haptic sense by acquiring dynamic physical information that is transferred bi-directionally between the surrounding environment and the human. An abandonment of haptics causes difficulty in further advance in mechatronics area, or may even result in threatening the safety and security of the process.
In fact, the area of mechatronics has lacked this concept for long time. Soft robotics is a realization of new concept coming from real haptics. This gives not only compliant motion but also skillful motion to the robot and/or mechatronics.
In the presentation the structure of soft robotics using a newly developed “haptic core-chip”. Also the talk will introduce various applications by visual demonstrations.

ROBCON 7 - Robotics & Motion Control VII / Industry Visit (AGL, Loy Yang)

LectTheatre 1 - 2E-101, Wednesday 15th of February, 10:20
Chair/s: Prof. Steven Wilcox, Prof. Toshiyuki Murakami

Measurement of Endpoint Stiffness in 6 Dimensions

Ms. Yukako Tani, Prof. Seiichiro Katsura

Precise Force Control for Contact with Flexible Object Considering Environmental Dynamics

Mr. Hiroki Kurumatani, Prof. Seiichiro Katsura

A Comparison on Genetic Algorithm Based Integer Order and Fractional Order PID Control of Magnetic Bearing System

Mr. Gokhan Altintas, Dr. Yucel Aydin

Geomagnetic Localization of Mobile Robot

Ms. Seon-Je Yang, Ms. Tae-Kyung Kim, Prof. Tae-Yong Kuc, Prof. Jong-Koo Park

A Study on Frequency Response Analysis Using Friction Model for Frictional Systems

Mr. Yuki Sugiura, Mr. Jun Kato, Prof. Yoshihiro Maeda, Prof. Makoto Iwasaki

Frequency Shaped Sliding Mode Control of Magnetorheological Smart Structure Systems

Mr. Sayed Royel, Dr. Quang Ha

MECHED - Cyber-Physical System & Mechatronics Education

LectTheatre 2 - 2E-201, Wednesday 15th of February, 10:20
Chair/s: Dr Gayan Appuhamillage, Dr Gour Karmakar

A Fuzzy Model-based Integration Framework for Vision-based Intelligent Surveillance Systems

Mr. Wahyono Wahyono, Mr. Alexander Filonenko, Mr. Laksono Kurnianggoro, Prof. Kang-Hyun Jo

Safe Prismatic Compliant Joint for Human Robot Collaboration

Mr. Younsse Ayoubi, Dr. Med Amine Laribi, Dr. Fabien Courrèges, Prof. Saïd Zeghloul, Dr. Marc Arsicault

Phototropic BristleBot Activity for Robotics and STEM Engagement

Dr. Robert Ross, Dr. Jonathan Stanger, Mr. Adam Console

BattleBots - A First Year Robotics-Based Inter-Discplinary Engineering Project

Dr. Robert Ross, Mr. Adam Console

Industry-led Mechatronics Degree Development in Regional Australia

Prof. M. Yousef Ibrahim, Dr. Gayan Kahandawa, Dr. Tanveer Choudhury, Dr. Abdul Mazid

AUTON 1 - Autonomous and Cyber-Physical Systems

LectTheatre 1 - 2E-101, Wednesday 15th of February, 13:20
Chair/s: Dr. Gour Karmakar, Dr Robert Ross

Labeled Multi-Bernoulli Tracking for Industrial Mobile Platform Safety

Mr. Tharindu Rathnayake, Dr. Reza Hoseinnezhad, Dr. Ruwan Tennakoon, Prof. Alireza Bab-Hadiashar

Multispectral Imaging of Crops in the Peruvian Highlands through a Fixed-Wing UAV System

Prof. Donato Flores, Prof. Carlos Saito, Mr. Juan Paredes, Mrs. Fedra Trujillano

Aerial Photography for 3D Reconstruction in the Peruvian Highlands through a Fixed-Wing UAV System

Prof. Donato Flores, Prof. Carlos Saito, Mr. Juan Paredes, Mrs. Fedra Trujillano

Novel Tire Inflating System using Extreme Learning Machine Algorithm for Efficient Tire Identification

Dr. Tanveer Choudhury, Dr. Gayan Kahandawa, Prof. Yousef Ibrahim, Mr. Pavel Dzitac, Dr. Abdul Md Mazid, Prof. Zhihong Man

A Data-Based Hybrid Driven Control for Networked-based Remote Control Applications

Dr. Truong Quang Dinh, Dr. James Marco, Prof. David Greenwood, Prof. Kyoung Kwan Ahn, Dr. Jong Il Yoon

Investigation of Enhancing Efficiency and Acceleration in a Flat Shape Axial Gap Motor Having High Torque Characteristic

Mr. Ren Tsunata, Prof. Masatsugu Takemoto, Prof. Satoshi Ogasawara, Ms. Asako Watanabe, Dr. Tomoyuki Ueno, Mr. Koji Yamada

INDAUT 1 - Industrial Automation

LectTheatre 2 - 2E-201, Wednesday 15th of February, 13:20
Chair/s: Prof Kouhei Ohnishi, Dr Gerasimos Rigatos

Smart Combination of Sensorless Electromagnetic Levitation and Zero Power Control: A Complimentary Pair Enhancing Mutual Strengths

Mr. Salman Ahmed, Prof. Takafumi Koseki

Deep Learning for Texture Classification Via Multi-wavelet Fusion of Scattering Transforms

Dr. Amir Dadashnialehi, Prof. Alireza Bab-Hadiashar, Dr. Reza Hoseinnezhad

A Study on Torsional Vibration Reduction for Variable-Speed Variable-Pitch Wind Turbines

Dr. Hongzhong Zhu, Prof. Shigeo Yoshida, Prof. Hiroyuki Kajiwara, Dr. Yasuyuki Ogawa, Dr. Shigeyuki Nakada, Dr. Junji Ono

A neurofuzzy adaptive H-infinity control method for DC-DC voltage converters

Dr. Gerasimos Rigatos, Dr. Pierluigi Siano, Dr. Moamar Sayed-Mouchaweh

Model Generation and Parameter Identification of Unknown Environment using Element Description Method

Mr. Issei Takeuchi, Dr. Seiichiro Katsura

Preliminary Measurement and Analysis of Microwave Transmission Attenuation in Small Gas Pipeline

Mr. Wen Zhao, Dr. Mitsuhiro Kamezaki, Mr. Kento Yoshida, Mr. Minoru Konno, Mr. Ryoichi Toriumi, Prof. Shigeki Sugano

Nondestructive Inspection of Voids in Concrete by Multi-layered Scanning Method with Electromagnetic Waves

Mr. Shotaro Kawataki, Prof. Takayuki Tanaka, Mr. Satoru Doi, Mr. Shigeru Uchida, Prof. Maria Feng

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