

2015 6th International Conference on Automation, Robotics and Applications

(ICARA 2015)

**Queenstown, New Zealand
17-19 February 2015**



**IEEE Catalog Number: CFP1598E-POD
ISBN: 978-1-4799-6467-3**

Table of Contents

S1A: Special Session on Electric Vehicles: Advances in Drives and Steering Mechanism

Active Electromagnetic Damping for a Lightweight Electric Vehicles.....	1
<i>Alista Fow and Mike Duke</i>	
The Implementation in VISSIM REALTIME of an Active Electromagnetic Damper Controller for Lightweight Electric Vehicles	6
<i>Alista Fow and Mike Duke</i>	
An Engineering Design of Real-time Fault Monitoring Method for Power-on-wheel Electric Vehicles	11
<i>Ziming (Tom) Qi, Kuang Ma, Nicholas Sargeant and William Phipps</i>	
A New Motors Fault Tolerance Control Strategy to 4WID Electric Vehicle	17
<i>Hao Qiu, Ziming (Tom) Qi</i>	
4-wheel Independent In-wheel-motor Drive and Independent Steering Electric Vehicle Safety Analysis Method Based on Mass Re-distribution Experiment.....	22
<i>Ziming (Tom) Qi, Xu Zhao, Kuang Ma, Matthew King, Wei-chen Lee, Ji-Wei Lin and Shao-Min Lee</i>	

S1B: Localisation and Mapping

Enhanced Noise Models for GPS positioning.....	28
<i>Andrew Soundy, Bradley Panckhurst and Tim C. A. Molteno</i>	
Robotics Audition Using Kinect	34
<i>Vempada Ramu Reddy, Parijat Deshpande, Ranjan Dasgupta</i>	
Topological Mapping for Robot Navigation using Affordance Features	42
<i>Karthik Mahesh Varadarajan</i>	
Constructing Contextual SLAM Priors using Architectural Drawings.....	50
<i>Christina Georgiou, Sean Anderson, Tony Dodd</i>	
Utilization of Terrain Elevation Map in SLAM for Unmanned Aircraft.....	57
<i>Youngjoo Kim, Hyochoong Bang</i>	

S1C: Man / Machine Interfacing

Augmented Reality behind the Wheel - Human Interactive Assistance by Mobile Robots	63
<i>Nuno Costa, Artur Arsenio</i>	
Human-Driven Multi-Robot Design Process - for Social Interactions with Children on Complex Environments	70
<i>David Gonçalves, Artur Arsenio</i>	
Vietnamese Sign Language Reader using Intel Creative Sens3D	77
<i>Duc Nguyen, Moi Tin Chew, Serge Demidenko</i>	
Changes in Perception of a Small Humanoid Robot.....	83
<i>Kerstin Haring, Katsumi Watanabe, David Silvera-Tawil, Mari Velonaki, Tomotaka Takahashi</i>	

S2A: Path Planning / Navigation

Construction Site Navigation for the Autonomous Excavator Thor	90
<i>Daniel Schmidt, Karsten Berns</i>	
A comparison of sampling-based path planners for a grape vine pruning robot arm	98
<i>Scott Paulin, Tom Botterill, Jessica Lin, XiaoQi Chen and Richard Green</i>	
Controller Comparisons for Autonomous Railway Following with a Fixed-Wing UAV	104
<i>Christopher Jarrett, Karl Perry and Karl Stol</i>	
SAMMY - An Algorithm for Efficient Computation of a Smooth Path for Reference Trajectory Generation	110
<i>Alexander Keck, Karl Lukas Knierim, Oliver Sawodny</i>	
Fuzzy Gain Scheduled EKF for Model-Based Skid-Steered Mobile Robot	116
<i>Bourhane Kadmiry</i>	

S2B: Manufacturing Systems

A Backward-oriented Approach for Offline Programming of Complex Manufacturing Tasks	124
<i>Ludwig Nägele, Miroslav Macho, Andreas Angerer, Alwin Hoffmann, Michael Vistein, Manfred Schönheits, Wolfgang Reif</i>	
Adaptive-VDHMM for Prognostics in Tool Condition Monitoring	131
<i>Yue Wu, Yoke-San Wong and Geok Soon Hong</i>	
Realistic Simulation of Industrial Bin-Picking Systems	137
<i>Adrian Schyja, Bernd Kuhlenkötter</i>	

S2C: Control 1

Simultaneous Base and End-Effector Motion Control of a Nonholonomic Mobile Manipulator	143
<i>Shengfeng Zhou, Yazhini C. Pradeep and Peter C.Y. Chen</i>	
Uniform Ultimate Boundedness of a Model Reference Adaptive Controller in the Presence of Unmatched Parametric Uncertainties	149
<i>Christian Heise and Florian Holzapfel</i>	
Application of Inverse Simulation to a Wheeled Mobile Robot	155
<i>Kevin Worrall, Douglas Thomson and Euan McGookin</i>	
Step Ascension of a Two-Wheeled Robot using Feedback Linearisation	161
<i>Jérémie X. J. Bannwarth, Callum Munster and Karl Stol</i>	
Fuzzy Reactive Control for Wheeled Mobile Robots	167
<i>Praneel Chand</i>	

S3A: Special Session on Mechatronic Music

A Comparative Evaluation of Percussion Mechanisms for Musical Robotics Applications	173
<i>Jason Long, Jim Murphy, Ajay Kapur, Dale A Carnegie</i>	
An Overview of MechBass: A Four String Robotic Bass Guitar	179
<i>James McVay, Dale A Carnegie and Jim Murphy</i>	

A Study on Improving Sound Quality of Violin Playing Robot.....	185
<i>Won-se Jo and Hyeonjun Park, Bumjoo Lee, Donghan Kim</i>	
Towards an Automated Pan Flute Player.....	192
<i>Kishan Kumar, Kishen Kumar, Praneel Chand, Dale A Carnegie</i>	

S3B: Health Systems 1

Gaussian Process Learning and Interpolation of Gait Motion for Rehabilitation Robots	198
<i>Changmook Chun, Seung-Jong Kim, Jisoo Hong, Frank Park</i>	
Spatial Probability Distribution for Port Planning in Minimal Invasive Robotic Surgery (MIRS).....	204
<i>Jessica Hutzl, Heinz Wörn</i>	
The Kinematic Synthesis of a Spatial, Hyper-Redundant System based on Binary Electromagnetic Actuators.....	211
<i>Svenja Tappe, Jens Kotlarski, Tobias Ortmaier, Michael Dörbaum, Axel Mertens and Bernd Ponick</i>	
Entertainment Services of a Healthcare Robot System for Older People in Private and Public Spaces	217
<i>Ho Seok Ahn, Chandan Datta, I-Han Kuo, Rebecca Stafford, Ngairé Kerse, Kathy Peri, Elizabeth Broadbent, Bruce MacDonald,</i>	

S3C: WSN / Communications

Helping Secure Robots in WSN Environments by Monitoring WSN Software Updates for Intrusion	223
<i>A S M Ashraful Alam, David Eyers and Zhiyi Huang</i>	
Protocol for Improved Energy Efficiency in Wireless Sensor Networks to Support Mobile Robots	230
<i>Debraj Basu, Gourab Sen Gupta, Xiang Gui and Giovanni Moretti</i>	
A Novel Approach of Sensor Data Retrieving using a Quadcopter in Wireless Sensor Network Forming Concentric Circular Topology	238
<i>Ranjan Dasgupta, Ritwick Mukherjee, Amitava Gupta</i>	
OPART: Towards an Open Platform for Abstraction of Real-Time Communication in Cross- Domain Applications	246
<i>Morteza Hashemi Farzaneh, Alois Knoll, Jonas Pfeiffer</i>	

S4A: Special Session on Sensing, Automation and Robotics in Agriculture

A Novel Vision Based Row Guidance Approach for Navigation of Agricultural Mobile Robots in Orchards	251
<i>Mostafa Sharifi and XiaoQi Chen</i>	
Design and Implementation of a Wireless Sensor Network for Rose Greenhouses Monitoring	256
<i>Mayra Erazo, David Rivas, Milton Pérez, Omar Galarza, Víctor Bautista, Monica Huerta and Jose Luis Rojo</i>	

Laser-Induced Breakdown Spectroscopy Analysis of Sodium in Pelletised Pasture Samples	262
<i>Harrisson Jull, Rainer Kunnemeyer, Sadhana Talele, Peter Schaare and Mark Seelye</i>	
Impulse Radar – a New Sensor for Robots	269
<i>Ian M Woodhead, Adrian Tan, Sean Richards and Ian G Platt</i>	
Automated Weighing by Sequential Inference in Dynamic Environments	274
<i>Andrew Martin and Tim C. A. Molteno</i>	

S4B: Tactile / Haptic Systems

Discriminative Touch from Pressure Sensors	279
<i>Adrien Jule, Brendan McCane, Alistair Knott and Steven Mills</i>	
Verification of Sinusoidal Steady State System Identification of a Phantom Omni Haptic Device using Data Driven Modeling	283
<i>Bartholomew Milne, Henrik Beelen, Ruben Merks, Siep Weiland, XiaoQi Chen, Christopher Hann and Richard Parker</i>	
A Multimodal Human Machine Interface for a Robotic Mobility Aid	289
<i>Johannes Schneider, Wilhelm Stork, Stephan Irgenfried, Heinz Wörn</i>	
Tactile Sensing System Using Electro-tactile Feedback	295
<i>Daniel Pamungkas and Koren Ward</i>	
Immersive Teleoperation of a Robot Arm Using Electro-tactile Feedback	300
<i>Daniel Pamungkas and Koren Ward</i>	

S4C: Underwater Systems

Review of Underwater SLAM Techniques	306
<i>Franco Hidalgo and Thomas Bräunl</i>	
Analysis of the Group Structure of a School of Biomimetic AUVS Coordinated Using Nearest Neighbour Principles	312
<i>Jonathan McColgan, Euan McGookin and Ahmad Naddi Ahmad Mazlan</i>	

IT2: Invited Talk 2

How To Plug-in Your Rover Into A Space Mission to Moon or Mars	318
<i>Mehran Sarkarati, Mario Merri, Kim Nergaard and Paul Steele</i>	

S5A: Bio-inspired Systems

Bio-inspired Knee Joint Mechanism for a Hydraulic Quadruped Robot	325
<i>Hamza Khan, Roy Featherstone, Darwin Caldwell and Claudio Semini</i>	
Concepts and Simulations of a Soft Robot Mimicking Human Tongue	332
<i>Xuanming Lu, Weiliang Xu, Xiaoning Li</i>	
Wheel Spider with Rolling Locomotion: Modeling and Simulation	337
<i>Takuma Nemoto, Mohan Rajesh Elara, Syunsuke Nansai and Masami Iwase</i>	
Rise Time Based Characterization of Sub-millimeter SMA Helical Actuator for Sensorless Displacement Estimation	343
<i>Sreekanth M, Abraham Mathew and R Vijayakumar</i>	

S5B: Robotic Arms

Development of Two Degrees of Freedom Deterministic Parallel Robotic Arm Unit.....	348
<i>Jimin Liang, Gong Zhang, Xianshuai Chen and Dazhi Wang</i>	
Inverse Engineering Design and Construction of an ABS Plastic, Six DOF Robotic Arm Structure.....	352
<i>David Rivas, Felix Manjarres, José Mena, Luis Carrillo-Medina, Víctor Bautista, Mayra Erazo, Milton Pérez, Omar Galarza and Monica Huerta</i>	
BRACON: Control System for a Robotic Arm With 6 Degrees of Freedom for Education Systems	358
<i>David Rivas, Marcelo Alvarez, Patricio Velasco, Javier Mamarandi, José Luis Carrillo-Medina, Víctor Bautista, Omar Galarza, Patricio Reyes, Mayra Erazo, Milton Pérez and Monica Huerta</i>	
Inverse Kinematics Solution for Trajectory Tracking using Artificial Neural Networks for SCORBOT ER-4u.....	364
<i>Rahul Kumar and Praneel Chand</i>	

S5C: Temperature / Force Sensors

Analysis and Selection of the Force Sensitive Resistors for Gait Characterisation.....	370
<i>Muhammad Shaikh, Zoran Salcic and Kevin I-Kai Wang</i>	
A Fabry-Perot Optical Fiber Force Sensor Based on Intensity Modulation for Needle Tip Force Sensing.....	376
<i>Zonglai Mo, Peter Xu and Neil Broderick</i>	
Towards Building an Accurate Low-Cost Biofeedback Platform using Force Sensors	381
<i>Johann Nel, Aaron Dalbeth, Gourab Sen Gupta and Ken Mercer</i>	

S6A: Special Session on Humans, software Agents, Robots, Machines and Sensors (HARMS)

An Intuitive Interaction System for Fire Safety Using A Speech Recognition Technology	388
<i>Seongha Park, Yongho Kim, Eric T. Matson, Changwha Lee, Hyeonae Jang , Wooram Park</i>	
Design of Virtual Instrument for Automatic Temperature Visualization in Magnetic Fields Using LabVIEW in Combination With Fiber-Optical Temperature Measurement	393
<i>Christina Pahl, Hanie Mazle and Eko Supriyanto</i>	
UGVs Spotting Fire Location for Cooperative Fire Security System using HARMS.....	400
<i>Mauricio Gomez, Eric Matson, JiHyun Song, Siyoung Baek and Junho Kim</i>	
Wireless Sensor Network and Big Data in Cooperative Fire Security System using HARMS.....	405
<i>Bakytgul Khaday, Eric Matson, John Springer, Young Ki Kwon, Hansu Kim, Sunbin Kim, Daulet Kenzhebalin, Sukyeong Cho, Jinwoong Yoon and Hong Seung Woo</i>	
Humanoid Robots Rescuing Humans and Extinguishing Fires for Cooperative Fire Security System using HARMS.....	411
<i>Amy Wagoner, Adith Jagadish, Eric Matson, EunSeop Lee, Kyeong Tae Kim, Dong Hyung Lee, Yoanna Nah and Ju-Eun Joeng</i>	

Implementing a HARMS-Based Software System for use in Collective Robotics Applications	416
<i>Alex Ryker, Eric Matson, Sangho Kim, Seokjun Lee, Insu Jang</i>	

S6B: Applications 1

A Fluid Dynamics Model for Wind Turbine Generators in Equatorial Environments	421
<i>Milton Pérez-Gutierrez, David Rivas-Lalaleo, Mayra Erazo-Rodas, Victor Bautista-Naranjo, Omar Galarza-Barrionuevo, Patricio Reyes-Bedoya, Monica Huerta and Jose Luis Rojo</i>	
Sensorless position control of voice-coil motors for needle-free jet injection	426
<i>James Mckeage, Rhys Williams, Bryan P. Ruddy, Poul F Nielsen and Andrew Taberner</i>	
An Efficient Solution Method for Multibody Systems with Loops Using Multiple Processors	430
<i>Tushar Ghosh, Luong Nguyen and Leslie Quioco</i>	
A Connected Component Labeling Algorithm for Sparse Lidar Data Segmentation	437
<i>Abhijeet Ravankar, Yukinori Kobayashi, Ankit Ravankar and Takanori Emaru</i>	
A View-based Method for Local Homing of Unmanned Rotorcraft	443
<i>Aymeric Denuelle, Saul Thurrowgood, Farid Kendoul, Mandyam Srinivasan</i>	

S6C: Vision Systems

Monocular and Range Camera Cross-Calibration for RGB-D Sensor Architectures	450
<i>Karthik Mahesh Varadarajan</i>	
Dominant Plane Detection using a RGB-D Camera for Autonomous Navigation	456
<i>Jiefei Wang, Matthew Garratt, Sreenatha Anavatti</i>	
Gibbs Sampling for 2D Cane Structure Extraction from Images	461
<i>Ricardo Castaneda Marin, Tom Botterill and Richard Green</i>	
Colour Identification using an Adaptive Colour Model	466
<i>Feng (Teddy) Su and Gu Fang</i>	
Eye Tracking System to Detect Driver Drowsiness	472
<i>Phuong Nguyen, Moi Tin Chew, Serge Demidenko</i>	
Towards Automatic Colour Segmentation for Robot Soccer	478
<i>Donald G. Bailey, Miguel Contreras and Gourab Sen Gupta</i>	

S7A: Health Systems 2

Speech-to-Speech Translation Humanoid Robot in Doctor's Office	484
<i>Sangmi Shin, Eric Matson, Jinok Park, Bowon Yang, Juhee Lee and Jin-Woo Jung</i>	
A Novel Real Time Alarm Detecting Device for the Operating Room	490
<i>Max Dinger, Jonas Pfeiffer and Tim Lüth</i>	
Application of a Commodity Smartphone for Fall Detection	495
<i>T.A. Dinh and Moi Tin Chew</i>	

S7B: Applications 2

General Plans for Removing Main Components in Cognitive Robotic Disassembly Automation	501
<i>Supachai Vongbunyong, Sami Kara and Maurice Pagnucco</i>	
Iterative Learning System to Intercept a Ball for Humanoid Soccer	507
<i>Mauricio Gomez, Yongho Kim and Eric Matson</i>	
An Interactive Finger-Gaming Robot with Real-Time Emotion Feedback	513
<i>Chyi-Yeu Lin, Li-Wen Chuang, Li-Chieh Cheng and Ke-Jeng Lin</i>	

S7C: Applications 3

Comprehensive Semantics in Robotic Intelligence and Communication: Necessity and Feasibility	519
<i>Victor Raskin and Julia Taylor</i>	
Force Trajectory Generation for the Redundant Actuator in a Pneumatically Actuated Stewart Platform	525
<i>Justin Pradipta, Karl Lukas Knierim, Oliver Sawodny</i>	

S8A: Aerial Systems

Experimental Validation of Cooperative Formation Control with Collision Avoidance for a Multi-UAV System	531
<i>Yasuhiro Kuriki and Toru Namerikawa</i>	
Decentralized Formation Control of Quadcopters using Feedback Linearization	537
<i>Arshad Mahmood and Yoonsoo Kim</i>	
Stabilization and Control of Autonomous Hexacopter via Visual-Servoing and Cascaded-Proportional and Derivative (PD) Controllers	542
<i>Omar Ahmed, Marsad Latief, Md A Ali and Rini Akmeliawati</i>	
Fault-Tolerant Position Tracking of a Hexacopter using an Extended State Observer	550
<i>Guillermo P. Falconi, Christian Heise and Florian Holzapfel</i>	

S8B: Optimisation

Nonlinear Model Predictive Control of a Hydraulic Excavator using Hammerstein Models	557
<i>Frank Bender, Marcus Sonntag and Oliver Sawodny</i>	
Ordered Escape Routing Using Network Flow and Optimization Model	563
<i>Kashif Sattar and Anjum Naveed</i>	
Switching Strategy for Direct Model Predictive Control in Power Converter and Drive Applications with High Switching Frequency	569
<i>Michael Leuer and Joachim Böcker</i>	
Stability Control for Manipulator Space Capture by Using Particle Swarm Optimization Based on Distributed Controllable Dampers	574
<i>Yichi Zhang, Ming Chu, Hanxu Sun and Zhenghong Dong</i>	

S8C: Control 2

A Fuzzy Q-Learning Based Assisted Power Management Method for Comfortable Riding of Pedelec	580
<i>Cheng-Ting Liu and Roy Chaoming Hsu</i>	
Design and Experimental Testing of Vehicle-Following Control for Small Electric Vehicles with Communication.....	586
<i>Takeki Ogitsu and Manabu Omae</i>	
Toward Visualising and Controlling Household Electrical Appliances	591
<i>Latha Karthigaa Murugesan, Rashina Hoda and Zoran Salcic</i>	
Configuration Space Impedance Control for Continuum Manipulators	597
<i>Lorenzo Toscano, Valentin Falkenhahn, Alexander Hildebrandt, Francesco Braghin and Oliver Sawodny</i>	