

# **Australasian Conference on Robotics and Automation (ACRA 2017)**

Sydney, Australia  
11-13 December 2017

## **Editors:**

**Sarath Kodagoda  
Teresa Vidal Calleja  
Alen Alempijevic**

ISBN: 978-1-5108-6011-7

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2017) by Australian Robotics and Automation Association  
All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact Australian Robotics and Automation Association  
at the address below.

Australian Robotics and Automation Association  
GPO Box 1527  
Sydney NSW 2001  
Australia

Phone: 61 7 3327 4501  
Fax: 61 7 3327 4455

[www.araa.asn.au](http://www.araa.asn.au)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## SENSING AND CONTROL

<b>STEEP TERRAIN ASCENSION CONTROLLER FOR HEXAPOD ROBOTS</b> .....	1
<i>Alberto Elfes, Navinda Kottege, Thomas Molnar, Ryan Steindl, Fletcher Talbot</i>	
<b>ACTIVE TASK DESIGN IN ADAPTIVE CONTROL OF REDUNDANT ROBOTIC SYSTEMS</b> .....	8
<i>Wenjie Lu, Dikai Liu</i>	
<b>A NEW MANIPULABILITY MEASURE FOR THE CONTROL OF CRAM: A CABLE-DRIVEN REMOTE ACCESS MANIPULATOR</b> .....	16
<i>Ali Haydar Goktogan, Wilhelm Johan Marais</i>	
<b>LOOP SHAPING DESIGN PROCEDURE FOR QUADROTOR CONTROL WITH WEIGHTS DESIGNED BY RESOLVING A CONSTRAINED NON-LINEAR OPTIMIZATION PROBLEM</b> .....	24
<i>Jonathan Currie, Joseph Thomas, David Wilson</i>	

## STUDENT AWARD(S) NOMINEE PAPERS

<b>QUASI-STATIC BALANCE OF A BIOINSPIRED ROBOTIC-SEAGULL ORNITHOPTER PERCHING ON A WIRE</b> .....	32
<i>Yuxin Pan , Ali Haydar Goktogan</i>	
<b>ENERGY-OPTIMAL KINODYNAMIC PLANNING FOR UNDERWATER GLIDERS IN FLOW FIELDS</b> .....	42
<i>James Ju Heon Lee, Chanyeol Yoo, Raewyn Hall, Stuart Anstee, Robert Fitch</i>	
<b>SIMULTANEOUS OPTICAL FLOW AND SEGMENTATION (SOFAS) USING DYNAMIC VISION SENSOR</b> .....	52
<i>Timo Stoffregen, Lindsay Kleeman</i>	
<b>MODULAR DEEP Q NETWORKS FOR SIM-TO-REAL TRANSFER OF VISUO-MOTOR POLICIES</b> .....	62
<i>Fangyi Zhang , Jürgen Leitner , Michael Milford , Peter Corke</i>	

## HUMAN ROBOT INTERACTION AND SYSTEMS

<b>AUGMENTED TELEPRESENCE FOR REMOTE INSPECTION WITH LEGGED ROBOTS</b> .....	72
<i>Benjamin Tam, Navinda Kottege, Branislav Kusy</i>	
<b>EFFECT OF EXTERNAL FORCE AND BIMANUAL OPERATION ON UPPER LIMB POSE DURING HUMAN-ROBOT COLLABORATION</b> .....	81
<i>Richardo Khonasty, Marc Carmichael, Dikai Liu, Stefano Aldini</i>	
<b>UPPER BODY POSE ESTIMATION UTILIZING KINEMATIC CONSTRAINTS FROM PHYSICAL HUMAN-ROBOT INTERACTION</b> .....	90
<i>Richardo Khonasty, Marc Carmichael, Dikai Liu, Kenneth J. Waldron</i>	
<b>HEART SIMULATOR: A PERIODIC PUMP TO SIMULATE THE CARDIAC MOTION IN AN AORTIC TEST-RIG</b> .....	100
<i>Siyuan Chen , Viet Hung Doan , Liang Zhao</i>	
<b>HUMAN USER IMPRESSIONS OF DAMPING METHODS FOR SINGULARITY HANDLING IN HUMAN-ROBOT COLLABORATION</b> .....	107
<i>Marc G. Carmichael, Stefano Aldini, Dikai Liu</i>	

## MACHINE LEARNING

<b>LEARNING TO NAVIGATE BY GROWING DEEP NETWORKS</b> .....	114
<i>Thushan Ganegedara, Lionel Ott, Fabio Ramos</i>	
<b>AUXILIARY TASKS TO IMPROVE TRIP HAZARD AFFORDANCE DETECTION ON CONSTRUCTION SITES</b> .....	124
<i>Sean McMahon, Tong Shen, Niko Sünderhauf, Ian Reid, Chunhua Shen, Michael Milford</i>	

<b>ROW FOLLOWING IN PERGOLA STRUCTURED ORCHARDS BY A MONOCULAR CAMERA USING A FULLY CONVOLUTIONAL NEURAL NETWORK</b> .....	133
<i>Jamie Bell, Bruce A. Macdonald, Ho Seok Ahn</i>	

## **SLAM**

<b>EFFICIENT ACTIVE SLAM BASED ON SUBMAP JOINING</b> .....	141
<i>Yongbo Chen , Shoudong Huang , Robert Fitch , Jianqiao Yu</i>	
<b>SPARSE POINT-PLANE SLAM</b> .....	148
<i>Mehdi Hosseinzadeh, Yasir Latif, Ian Reid</i>	
<b>ROBUST DENSE OPTICAL FLOW WITH UNCERTAINTY FOR MONOCULAR POSE-GRAPH SLAM</b> .....	156
<i>Yonhon Ng, Jonghyuk Kim, Hongdong Li</i>	
<b>VECTOR DISTANCE FUNCTION BASED MAP REPRESENTATION FOR ROBOT LOCALISATION</b> .....	165
<i>Janindu Arukgoda, Ravindra Ranasinghe, Lakshitha Dantanarayana, Gamini Dissanayake, Tomonari Furukawa</i>	

## **PERCEPTION**

<b>MOTION STATES INFERENCE THROUGH 3D SHOULDER GAIT ANALYSIS AND HIERARCHICAL HIDDEN MARKOV MODELS</b> .....	173
<i>Julien Collart, Robert Fitch, Alen Alempijevic</i>	
<b>USING PLANAR POINT CORRESPONDENCE TO CALIBRATE CAMERA ARRAYS FOR LIGHT FIELD ACQUISITION</b> .....	181
<i>Ashley W. Stewart, Donald G. Dansereau</i>	
<b>FUSING LIDAR AND SEMANTIC IMAGE INFORMATION IN OCTREE MAPS</b> .....	187
<i>Julie Stephany Berrio Perez, James Robert Ward, Stewart Worrall, Wei Zhou, Eduardo Nebot</i>	

## **ROBOTIC VISION**

<b>EXTENDING PARALLAX PARAMETERISED BUNDLE ADJUSTMENT TO STEREO</b> .....	194
<i>Brenton Leighton, Liang Zhao, Shoudong Huang, Gamini Dissanayake</i>	
<b>STRAIGHTENING SEQUENCE-SEARCH FOR APPEARANCE-INVARIANT PLACE RECOGNITION USING ROBUST MOTION ESTIMATION</b> .....	203
<i>Sourav Garg, Michael Milford</i>	
<b>IMAGE REJECTION AND MATCH VERIFICATION TO IMPROVE SURFACE-BASED LOCALIZATION</b> .....	213
<i>James Mount, Michael Milford</i>	
<b>ENHANCING UNDERGROUND VISUAL PLACE RECOGNITION WITH SHANNON ENTROPY SALIENCY</b> .....	223
<i>Fan Zeng, Adam Jacobson, David Smith, Nigel Boswell, Thierry Peynot, Michael J. Milford</i>	

## **PATH PLANNING**

<b>PATH PLANNING FOR AUTONOMOUS BULLDOZERS</b> .....	233
<i>Masami Hirayama, Jose Guivant, Jayantha Katupitiya, Mark Whitty</i>	
<b>A DISTRIBUTED SEARCH ALGORITHM FOR MULTIPLE ROBOTS WITH COLLISION AVOIDANCE</b> .....	239
<i>Xiaotian Yang</i>	
<b>THE COLLISION AVOIDANCE CONTROL ALGORITHM OF THE UAV FORMATION FLIGHT</b> .....	248
<i>Jialong Zhang</i>	
<b>INSECT LEVEL INTELLIGENCE IS SUFFICIENT TO MOVE FURNITURE</b> .....	255
<i>Bimal Prakash Sharma, Frederic Maire</i>	

## **SENSING AND CONTROL**

<b>CONTACTLESS POSITION SENSING AND CONTROL OF PNEUMATIC CYLINDERS USING A HALL EFFECT SENSOR ARRAY .....</b>	<b>264</b>
<i>Tim Hojnik, Paul Flick, Jonathan Roberts</i>	
<b>OPTIMAL SENSING GEOMETRY FOR PSEUDORANGE AND BEARING-ELEVATION OBSERVATIONS .....</b>	<b>272</b>
<i>Jonghyuk Kim, Weikun Chen</i>	
<b>DESIGN AND CONTROL OF CRAM: A HIGHLY ARTICULATED CABLE-DRIVEN REMOTE ACCESS MANIPULATOR FOR CONFINED SPACE INSPECTION .....</b>	<b>278</b>
<i>Wilhelm Johan Marais, Ali Haydar Goktogan</i>	
<b>ROBUST HETEROGENEOUS MULTI-ROBOT TASK ALLOCATION FOR LOW- INTELLIGENCE AGENTS .....</b>	<b>287</b>
<i>Nick Sullivan, Steven Grainger, Ben Cazzolato</i>	
<b>A SURVEY ON INVERSE DYNAMICS SOLVERS FOR CABLE-DRIVEN PARALLEL ROBOTS.....</b>	<b>296</b>
<i>Yin Pok Chan, Jonathan Eden, Darwin La, Denny Oetomo</i>	
<b>REASONING ABOUT NATURAL LANGUAGE PHRASES FOR SEMANTIC GOAL DRIVEN EXPLORATION .....</b>	<b>305</b>
<i>Ben Talbot, Ruth Schulz, Ben Upcroft, Gordon Wyeth</i>	
<b>A REAL-TIME VISION-BASED METHOD TO OVERLAY MEDICAL IMAGING DATA ONTO A MOVING PATIENT .....</b>	<b>315</b>
<i>Matthew Lanaro, Jonathan Roberts, Peter Corke</i>	
<b>Author Index</b>	