

# **2019 IEEE International Conference on Advanced Robotics and its Social Impacts (ARSO 2019)**

**Beijing, China**

**31 October – 2 November 2019**



**IEEE Catalog Number: CFP19ARS-POD**  
**ISBN: 978-1-7281-3177-1**

**Copyright © 2019 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP19ARS-POD
ISBN (Print-On-Demand):	978-1-7281-3177-1
ISBN (Online):	978-1-7281-3176-4
ISSN:	2162-7568

**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) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# TABLE OF CONTENTS

<b>ON-LINE MOTION PREDICTION AND ADAPTIVE CONTROL IN HUMAN-ROBOT HANDOVER TASKS</b> .....	1
<i>Min Wu ; Bertram Taetz ; Ernesto Dickel Saraiva ; Gabriele Bleser ; Steven Liu</i>	
<b>DISTRIBUTED TELEOPERATION SYSTEM FOR CONTROLLING HETEROGENEOUS ROBOTS BASED ON ROS</b> .....	7
<i>Fei Yuan ; Lei Zhang ; Huayan Zhang ; Dezhong Li ; Tianwei Zhang</i>	
<b>A TARGET POSITION DECISION SYSTEM BASED ON EYEWITNESS ACCOUNT FOR EXPLORING DISASTER ENVIRONMENT</b> .....	13
<i>Kyon-Mo Yang ; Jong-Boo Han ; Kap-Ho Seo</i>	
<b>EVALUATION OF SHAPE-CHANGING TENSEGRITY STRUCTURE ROBOT FOR PHYSICAL HUMAN-ROBOT INTERACTION</b> .....	20
<i>Satoshi Yagi ; Sunhwi Kang ; Shiqi Yu ; Hamed Mahzoon</i>	
<b>REMOTE REFERENCE-DESK SERVICE SYSTEM USING ANDROID ROBOT FOR UNIVERSITY LIBRARIAN</b> .....	25
<i>Tomohiro Umetani ; Tomoya Kikuchi ; Naoki Saiwaki</i>	
<b>EXPERIMENTAL STUDY FOR CONTROLLER-FRIENDLY CONTACT ESTIMATION FOR HUMANOID ROBOT</b> .....	28
<i>Takahiro Ito ; Ko Ayusawa ; Eiichi Yoshida ; Abderrahmane Kheddar</i>	
<b>AGED CARE WITH SOCIALLY ASSISTIVE ROBOTICS UNDER ADVANCE CARE PLANNING</b> .....	34
<i>J. Koimizu</i>	
<b>MUSCULOSKELETAL ESTIMATION USING INERTIAL MEASUREMENT UNITS AND SINGLE VIDEO IMAGE</b> .....	39
<i>Vincent Samy ; Ko Ayusawa ; Yusuke Yoshiyasu ; Ryusuke Sagawa ; Eiichi Yoshida</i>	
<b>HYDRODYNAMIC ANALYSIS OF WEBBED FOOT FOR A NOVEL BIOMIMETIC ROBOTIC DUCK</b> .....	45
<i>Huikang Liu ; Zan Li ; Yao Hu ; Liwei Shi ; Shuxiang Guo ; Xihuan Hou ; Huiming Xing ; Yu Liu ; Debin Xia</i>	
<b>KINEMATIC ANALYSIS OF EFFECT ON WALKING MOTION BY ASSISTIVE POWERED WEAR WITH WIRE-DRIVEN ASSIST</b> .....	51
<i>Yumeko Imamura ; Kenta Murakami ; Fumiya Hanzawa ; Kazuaki Kishimoto ; Yuko Otake ; Masahiko Sumitani</i>	
<b>BIOMECHANICAL ANALYSIS IN THE SAGITTAL PLANE AT DIFFERENT WALKING SPEEDS DURING STAIR CLIMBING</b> .....	57
<i>Jian Lan ; Jiwen Zhang ; Hyunjun Park ; Chenglong Fu ; Ken Chen</i>	
<b>PLANNING AND CONTROL OF FORWARD JUMPING MOVEMENT OF HUMANOID ROBOT</b> .....	61
<i>Wenxi Liao ; Xuechao Chen ; Gao Huang ; Haoxiang Qi ; Qingqing Li ; Zhangguo Yu ; Qiang Huang</i>	
<b>DIMENSIONALITY REDUCED PRE-GRASP PLANNING FOR BIONIC HAND USING Q-DISTANCE QUALITY MEASUREMENT</b> .....	68
<i>Xishuo Zhu ; Zhangguo Yu ; Xuechao Chen ; Libo Meng ; Mingyue Qin</i>	
<b>MULTI-OBJECT GRASP PLANNING IN HIGH DISTRIBUTION DENSITY OF SERVICE ROBOT USING INVERSE REACHABILITY MAP AND BASE REPOSITIONING</b> .....	73
<i>Yi. Xing ; J. T. C. Tan ; Feng Wang ; Haonan Song</i>	
<b>A NOVEL CONTROL STRATEGY FOR CABLE-DRIVEN PARALLEL ROBOTS WITH UNKNOWN JACOBIANS</b> .....	79
<i>Hao Xiong ; Lin Zhang ; Xiumin Diao</i>	
<b>POSITION CONTROL OF FLEXIBLE JOINT ROBOTS WITH PD CONTROLLER BASED ON DISTURBANCE OBSERVER</b> .....	84
<i>Peiwen Li ; Lei Sun ; Wen Zhao ; Wei Yin ; Jingtai Liu</i>	
<b>MODULAR DESIGN SOLUTIONS OF BIT WHEELCHAIR FOR MOTION ASSISTANCE</b> .....	90
<i>Gao Huang ; Marco Ceccarelli ; Weimin Zhang ; Qiang Huang</i>	
<b>AN INTEGRATED JOINT FOR COOPERATIVE ROBOTS</b> .....	97
<i>Jianzhong Tang ; Lin Cheng ; Jiayu Liu ; Yifan Wang ; Rujia Liu</i>	
<b>MULTIMODAL FUSION TRANSCUTANEOUS ELECTRICAL SYSTEM FOR HAPTIC FEEDBACK</b> .....	102
<i>Xiaodong Lv ; Luyao Chen ; Chuankai Dai ; Yiran Lang ; Rongyu Tang ; Jiping He</i>	
<b>PILOT STUDY ON THE NEEDS OF PROSPECTIVE EXOSKELETON USERS WITH IMPAIRED MOBILITY</b> .....	106
<i>Namita Anil Kumar ; Shawanee Patrick ; Pilwon Hur</i>	

<b>DEVELOPMENT OF A REMOTELY CONTROLLED ROBOTIC HAND SYSTEM FOR SURGICAL APPLICATION .....</b>	<b>112</b>
<i>Aiman Omer ; Kentaro Kato ; Jamal Hamdi ; Atsuo Takamishi</i>	
<b>DEVELOPMENT OF A NEW VARIABLE CURVATURE FLEXIBLE JOINT BASED SURGICAL MANIPULATOR FOR A NARROW WORKSPACE .....</b>	<b>117</b>
<i>Quanquan Liu ; Chunbao Wang ; Xin Zhang ; Bo Zhang ; Lihong Duan ; Jiayang Dong ; Wanfeng Shang ; Haidong Wang ; Weiping Li ; Zhengzhi Wu ; Weiguang Li ; Xingguang Duan ; Masakatsu G. Fujie</i>	
<b>RESEARCH ON NEEDLE ASPIRATION ROBOT FOR DIAGNOSIS OF THYROID NODULES .....</b>	<b>122</b>
<i>Jian Zhao ; Honghua Zhao ; Dianmin Sun ; Xuyin Gong ; Zhitong Hu ; Yaohua Zhao</i>	
<b>DESIGN AND KINEMATIC ANALYSIS OF A ROBOTICS MAXILLOFACIAL SURGERY SYSTEM.....</b>	<b>128</b>
<i>Lixing Jin ; Xingguang Duan ; Yonggui Wang ; Huanyu Tian ; Hao Wen</i>	
<b>ONE-DIMENSIONAL ATTITUDE CONTROL FOR BIT FLYING ROBOT.....</b>	<b>134</b>
<i>Tao Zheng ; Yunqi Liu ; Long Li ; Hui Li ; Marco Ceccarelli</i>	
<b>ROBUST CONTROL APPROACH FOR NOVEL STABILIZED PLATFORM WITH SERIES ELASTIC ACTUATOR.....</b>	<b>141</b>
<i>Mingyang Li ; Lei Sun ; Wen Zhao ; Jingtai Liu</i>	
<b>CONSTRAINED MOTION PLANNING FOR FLIPPING STICK-LIKE OBJECTS .....</b>	<b>147</b>
<i>Mohamed Raessa ; Weiwei Wan ; Kensuke Harada</i>	
<b>A SHORT-TERM MOTION PREDICTION APPROACH FOR GUARANTEED COLLISION-FREE PLANNING .....</b>	<b>153</b>
<i>Baolin Liu ; Fei Zhac ; Zheng Sun ; Xing Liu ; Gedong Jiang</i>	
<b>ROBUST IMPEDANCE CONTROL .....</b>	<b>159</b>
<i>Yuancan Huang ; Lulu Liang</i>	
<b>ADMITTANCE CONTROL BASED HUMANOID ROBOT STANDING BALANCE CONTROL .....</b>	<b>167</b>
<i>Luo Cheng Zheng ; Pengfei Rao ; Yingke Li ; Mingguo Zhao</i>	
<b>WALKING CONTROL OF BIPED ROBOTS ON UNEVEN TERRAINS BASED ON SLIP MODEL .....</b>	<b>174</b>
<i>Xiang Meng ; Zhangguo Yu ; Gao Huang ; Xuechao Chen ; Weijie Qi ; Qiang Huang ; Bo Su</i>	
<b>DESIGN OF AN ELASTICALLY SUSPENDED BACKPACK WITH A TUNABLE DAMPER.....</b>	<b>180</b>
<i>Lianxin Yang ; Yuning Xu ; Jiwen Zhang ; Ken Chen ; Chenglong Fu</i>	
<b>VARIABLE REDUCTION RATIO KNEE JOINT INSPIRED BY CRUCIATE LIGAMENT FOR LEGGED ROBOT.....</b>	<b>186</b>
<i>Batao Liu ; Huaxin Liu ; Fei Meng ; Zewen He ; Ru Kang ; Lei Wang ; Aiguo Ming ; Qiang Huang</i>	
<b>MECHANICAL STRUCTURE DESIGN OF A ROBOT LEG WITH A PARALLEL ROD MECHANISM WITH LOW MOMENT OF INERTIA.....</b>	<b>191</b>
<i>Xin Zhu ; Xuxiao Fan ; Fei Meng ; Huaxin Liu ; Zewen He ; Guoliang Wu ; Botao Liu ; Lei Wang ; Ru Kang ; Aiguo Ming ; Qiang Huang</i>	
<b>PERCEIVED ANSHIN FOR ANTHROPOMORPHIZED ROBOTS COMPARED AMONG U.S., CHINA, AND JAPAN .....</b>	<b>197</b>
<i>Tatsuo Arai ; Hiroko Kamide ; Xiaoming Liu ; Yuqing Lin</i>	
<b>ROBOTICS AT WORK - NEWS HEADLINE ANALYSIS 2016.....</b>	<b>202</b>
<i>Julia Riemer ; Sascha Wischniewski</i>	
<b>A STUDY OF POTENTIAL SOCIAL IMPACTS OF SOFT ROBOTS WITH ORGANIC AND EDIBLE BODIES BY OBSERVATION OF AN ARTWORK.....</b>	<b>208</b>
<i>Hiromi Mochiyama ; Mitsuhiro Ando ; Kenji Misu ; Teppei Kuroyanagi</i>	
<b>SHAPING THE GOVERNANCE FRAMEWORK TOWARDS THE ARTIFICIAL INTELLIGENCE FROM THE RESPONSIBLE RESEARCH AND INNOVATION.....</b>	<b>213</b>
<i>Han Zhang ; Lu Gao</i>	
<b>HRIPRENEUR THINKING: STRATEGIES TOWARDS FASTER INNOVATION AND COMMERCIALIZATION OF ACADEMIC HRI RESEARCH .....</b>	<b>219</b>
<i>Ker-Jiun Wang ; Mohammad Shidujaman ; Caroline Yan Zheng ; Prakash Thakur</i>	
<b>DEBATE ON THE ISSUE OF “WHETHER AI CAN SURPASS HUMAN”: AN ANALYSIS BASED ON THE HISTORICAL PERSPECTIVE.....</b>	<b>227</b>
<i>Wang Yanyu</i>	
<b>SCIENTIFIC MAPPING OF 35 YEARS OF HUMAN FACTORS RESEARCH IN OCCUPATIONAL HUMAN-ROBOT-INTERACTION .....</b>	<b>235</b>
<i>Patricia H. Rosen ; Sascha Wischniewski</i>	
<b>DYNAMIC GAIT TRANSITION OF A HUMANOID ROBOT FROM HAND-KNEE CRAWLING TO BIPEDAL WALKING BASED ON KINEMATIC PRIMITIVES .....</b>	<b>240</b>
<i>Yan Huang ; Qingqing Li ; Aiguo Ming ; Yu Liu ; Yaliang Liu ; Qiang Huang</i>	

<b>DESIGN AND BASIC CONTROL OF EXTRA ROBOTIC LEGS FOR DYNAMIC WALKING ASSISTANCE</b> .....	246
<i>Ming Hao ; Jiwen Zhang ; Ken Chen ; Chenglong Fu</i>	
<b>FOOT TRAJECTORY PLANNING OF BIPEDAL WALKING ROBOT BASED ON A UNIFORM ACCELERATION METHOD</b> .....	251
<i>Chunyu Jiang ; Junyao Gao ; Xuanyang Shi ; Dingkui Tian ; Qiang Huang</i>	
<b>A HUMANOID SOFT ROBOTIC JOINT WITH VARIABLE STIFFNESS</b> .....	256
<i>Liqun Huang ; Yingwei Wei ; Xiuli Zhang</i>	
<b>STUDY ON QUASI-PASSIVE WALKING ROBOT BASED ON IMPULSE THRUST</b> .....	261
<i>Jinkun Liu ; Xuechao Chen ; Xuejian Qiu ; Libo Meng ; Zhangguo Yu ; Qiang Huang</i>	
<b>VIRTUAL-MODEL-BASED COMPLIANCE CONTROL FOR PUSHING RECOVERY OF POSITION CONTROLLED HUMANOID ROBOTS</b> .....	265
<i>Huanzhong Chen ; Gao Huang ; Qingqing Li ; Xuechao Chen ; Zhangguo Yu ; Qiang Huang</i>	
<b>INTELLIGENT CONTROL FOR ILLUMINANCE MEASUREMENT BY AN AUTONOMOUS MOBILE ROBOT</b> .....	270
<i>R. Inoue ; T. Arai ; Y. Toda ; M. Tsujimoto ; K. Taniguchi ; N. Kubota</i>	
<b>CONTROL OF A CABLE-DRIVEN PARALLEL ROBOT VIA DEEP REINFORCEMENT LEARNING</b> .....	275
<i>Tianqi Ma ; Hao Xiong ; Lin Zhang ; Xiumin Diao</i>	
<b>EGO-CENTRIC FRAMEWORK FOR A THREE-WHEEL OMNI-DRIVE TELEPRESENCE ROBOT</b> .....	281
<i>Ruchik Mishra ; Yug Ajmera ; Nikhil Mishra ; Arshad Javed</i>	
<b>COURSE CONTROL OF UNMANNED SURFACE VEHICLE BASED ON FUZZY SLIDING MODE</b> .....	287
<i>Chunxin Wang ; Shaorong Xie ; Huiqi Chen ; Yan Peng ; Dan Zhang</i>	
<b>FIRE FIGHTING TACTICS WITH AERIAL HOSE-TYPE ROBOT “DRAGON FIREFIGHTER”</b> .....	291
<i>Hisato Ando ; Yuichi Ambe ; Tomoka Yamaguchi ; Masashi Konyo ; Kenjiro Tadakuma ; Shigenao Maruyama ; Satoshi Tadokoro</i>	
<b>DEVELOPMENT AND FLIGHT EXPERIMENTS OF A BLUFF-BODIED X4-BLIMP</b> .....	298
<i>Keigo Watanabe ; Kenjiro Niwa ; Isaku Nagai</i>	
<b>A RESEARCH ON THE FUSION OF SEMANTIC SEGMENT NETWORK AND SLAM</b> .....	304
<i>Zhuo Chen ; Weimin Zhang ; Fangxing Li ; Yongliang Shi ; Yang Wang ; Fuyu Nie ; Chi Zhu ; Qiang Huang</i>	
<b>A METHOD OF RECOGNIZING OBSTACLES FOR A SMALL-SIZED AUTONOMOUS UNDERWATER VEHICLE X4-AUV</b> .....	310
<i>Keigo Watanabe ; Shingo Sugano ; Isaku Nagai</i>	
<b>RESFPA-GAN: TEXT-TO-IMAGE SYNTHESIS WITH GENERATIVE ADVERSARIAL NETWORK BASED ON RESIDUAL BLOCK FEATURE PYRAMID ATTENTION</b> .....	317
<i>Jingcong Sun ; Yimin Zhou ; Bin Zhang</i>	
<b>ATTENTION ALIGNMENT BY LINEAR SPACE PROJECTION FOR VIDEO FEATURES EXTRACTION</b> .....	323
<i>Yuan Shengqiang ; Mei Xue ; He Yi ; Zhang Jin</i>	
<b>MISMATCH REMOVAL OF VISUAL ODOMETRY USING KLT DANGER-POINTS TRACKING AND SUPPRESSION</b> .....	330
<i>Fuyu Nie ; Weimin Zhang ; Fangxing Li ; Yongliang Shi ; Ziyuan Guo ; Yang Wang ; Qiang Huang</i>	
<b>DEEP LEARNING BASED IMAGE RECONSTRUCTION FROM BRAIN DATA DURING OBJECT-GRASPING TASK WITH A BMI</b> .....	335
<i>David Hernandez-Carmona ; Christian I. Penalzoza</i>	
<b>KINETICS MODELING METHOD FOR WIRE ROPE TRANSMISSION SYSTEM BASED ON THE EQUIVALENT MECHANICS MODEL OF WIRE ROPE AND ITS APPLICATION TO THE FDU-II UNIT</b> .....	340
<i>Xin Cao ; Weiguo Wu</i>	
<b>SIMULATION OF KINEMATIC ACCURACY OF A 6-DOF SERIAL ROBOTIC MECHANISM BASED ON SCREW THEORY</b> .....	346
<i>Shihui Lang ; Hongbing Xin ; Zhangguo Yu</i>	
<b>DESIGN, FABRICATION AND EXPERIMENT OF 3-DOF PNEUMATIC FLEXIBLE ACTUATOR</b> .....	351
<i>Hailiang Meng ; Wenbiao Wang ; Fei Yang ; Shibo Cai ; Guanjun Bao</i>	
<b>DESIGN OF A HIGH TORQUE DENSITY MOTOR BASED ON HALBACH ARRAY INTEGRAL RING ROTOR</b> .....	355
<i>Wu Zhang ; Zhangguo Yu ; Yanjie Wang ; Xuechao Chen ; Qiang Huang ; Weimin Zhang ; Libo Meng</i>	
<b>DEVELOPMENT OF EMG PROSTHETIC HAND FOR INFANT WITH LIGHTNESS AND HIGH PINCH FORCE</b> .....	360
<i>Taichi Hirai ; Shunta Togo ; Yinlai Jiang ; Hiroshi Yokoi</i>	

<b>HYDRAULIC DAMPING AND SWING ASSISTANCE CONTROL OF A ROBOTIC ELECTROHYDRAULIC TRANSFEMORAL PROSTHESIS: PRELIMINARY RESULTS</b> .....	365
<i>Siyuan Gao ; Chentao Wang ; Jinying Zhu ; Jingeng Mai ; Qining Wang</i>	
<b>MODEL PREDICTIVE CONTROL FOR HUMAN FOLLOWING REHABILITATION ROBOT</b> .....	369
<i>Shihao Yan ; Jing Tao ; Jian Huang ; Anshun Xue</i>	
<b>DESIGN OF FINGER BENDING ANGLE DETECTION SYSTEM AND FES SYSTEM BASED ON FINGER &amp; WRIST REHABILITATION ROBOT</b> .....	375
<i>Tong Wang ; Jianjun Wei ; Chunbao Wang ; Quanquan Liu ; Zhixian Mao ; Lihong Duan ; Wanfeng Shang ; Yajing Shen ; Zhuohua Lin ; Zhengzhi Wu</i>	
<b>STIMULATION WAVE PROFILES FOR ELBOW FLEXION IN SURFACE ELECTRICAL STIMULATION BASED ON BURST-MODULATED SYMMETRIC BIPHASIC RECTANGULAR WAVES</b> .....	381
<i>Ryunosuke Tazawa ; Daisuke Okano ; Yuki Hatazawa ; Masao Sugi ; Shunta Togo ; Yinlai Jiang ; Hiroshi Yokoi</i>	
<b>THE DEVELOPMENT OF AN UNDERWATER SEMG SIGNAL RECOGNITION SYSTEM BASED ON CONDUCTIVE SILICON</b> .....	387
<i>Jianing Xue ; Yikang Yang ; Jiawei Chen ; Yinlai Jiang ; Chi Zhu ; Hiroshi Yokoi ; Feng Duan</i>	
<b>A PRELIMINARY INVESTIGATION OF USING HUMANOID SOCIAL ROBOTS AS NON-PHARMACOLOGICAL TECHNIQUES WITH CHILDREN</b> .....	393
<i>Gloria Beraldo ; Emanuele Menegatti ; Valentina De Tommasi ; Roberto Mancin ; Franca Benini</i>	
<b>DYNAMIC PROXEMIC DISTANCES IN DIFFERENT SOCIAL ENVIRONMENTS</b> .....	401
<i>Lei Zhou ; Meng Liu ; Jingtai Liu</i>	
<b>PUSH AND PULL: SHEPHERDING MULTI-AGENT ROBOT TEAMS IN ADVERSARIAL SITUATIONS</b> .....	407
<i>Michael J. Pettinati ; Ronald C. Arkin</i>	
<b>DEVELOPMENT OF AN AUXILIARY POSITIONING ROBOT FOR ULTRASONIC DIAGNOSIS</b> .....	415
<i>Zhengdi Sun ; Chunbao Wang ; Jianjun Wei ; Zhixiang Lu ; Quanquan Liu ; Tong Wang ; Lihong Duan ; Guangshuai Zhang ; Yulong Wang ; Jianjun Long ; Zhengzhi Wu</i>	
<b>AN IMPROVED ADAPTIVE MONTE CARLO LOCALIZATION ALGORITHM FUSED WITH ULTRA WIDEBAND SENSOR</b> .....	421
<i>Yang Wang ; Weimin Zhang ; Fangxing Li ; Yongliang Shi ; Zhuo Chen ; Fuyu Nie ; Chi Zhu ; Qiang Huang</i>	
<b>Author Index</b>	