

2015 IEEE International Conference on Rehabilitation Robotics (ICORR 2015)

**Singapore
11-14 August 2015**

Pages 1-513



**IEEE Catalog Number: CFP15CRR-POD
ISBN: 978-1-4799-1809-6**

Technical Papers

Prosthesis and Orthosis

Session I	Prosthesis and Orthosis
Date/Time	Wednesday, 12 August 2015 / 09:30 - 12:20
Chair	Prof. Derek Kamper, <i>Rehabilitation Institute of Chicago, USA</i>
Co-chair	Prof. Conor James Walsh, <i>Harvard University, USA</i>

- 0005 **Ultrasound Imaging for Hand Prosthesis Control: A Comparative Study of Features and Classification Methods....1**
Valerio Ortenzi, Sergio Tarantino, Claudio Castellini and Christian Cipriani
- 0044 **A Passive Transfemoral Prosthesis with Movable Ankle for Stair Ascent....7**
Shun Yoshida, Takahiro Wada and Koh Inoue
- 0068 **A Collaborative Approach to the Simultaneous Multi-joint Control of a Prosthetic Arm....13**
Craig Sherstan, Joseph Modayil and Patrick M. Pilarski
- 0221 **Foot Pronation Monitoring Using Wireless Biaxial Force Sensing System....19**
Gwang Min Gu, Kyungseo Park, Eo Jin Kim, Dong Yeon Lee and Jung Kim
- 0102 **Torque Control of a Push-Pull Cable Driven Powered Orthosis for the CORBYS Platform....25**
Carlos Rodriguez Guerrero, Victor Grosu, Svetlana Grosu, Adrian Leu, Danijela Ristic-Durrant, Bram Vanderborght and Dirk Lefeber
- 0158 **Added Value of a User-Adaptive Prosthetic Knee in Planned Gait Initiation: Off to a 3 Good Start?....31**
E. C. Prinsen, M. J. Nederhand, J. S. Rietman and H. F. J. M. Koopman
- 0100 **Neural Closed-loop Control of a Hand Prosthesis using Cross-modal Haptic Feedback....37**
Alison Gibson and Panagiotis Aramendias
- 0151 **Gait Phase Detection Based on Non-Contact Capacitive Sensing: Preliminary Results....43**
Enhao Zheng, Nicola Vitiello and Qining Wang

Upper Limb Exoskeleton

Session II	Upper Limb Exoskeleton
Date/Time	Wednesday, 12 August 2015 / 13:40 - 15:30
Chair	Prof. Marcia O'Malley, <i>RICE University, USA</i>
Co-chair	Prof. Fabrizio Sergi, <i>University of Delaware, USA</i>

- 0018 **A Full Upper Limb Robotic Exoskeleton for Reaching and Grasping Rehabilitation Triggered by MI-BCI....49**
M. Barsotti, D. Leonardis, C. Loconsole, M. Solazzi, E. Sotgiu, C. Procopio, C. Chisari, M. Bergamasco and A. Frisoli
- 0094 **EMG Controlled Soft Robotic Glove for Assistance During Activities of Daily Living....55**
Panagiotis Polygerinos, Kevin C. Galloway, Siddharth Sanan, Maxwell Herman and Conor J. Walsh
- 0055 **A Series Elastic Composite Actuator for Soft Arm Exosuits : Design and Preliminary Test....61**
Leonardo Cappello, Alberto Pirrera, Paul Weaver and Lorenzo Masia
- 0198 **Using the Robotic Sixth Finger and Vibrotactile Feedback for Grasp Compensation in Chronic Stroke Patients....67**
Irfan Hussain, Gionata Salvietti, Leonardo Meli, Claudio Pacchierotti, David Cioncoloni, Simone Rossi and Domenico Prattichizzo
- 0188 **The Effect of CAREX on Muscle Activation during a Point-to-point Reaching Task....73**
Xin Jin, Viswanath Aluru, Preeti Raghavan and Sunil K. Agrawal

- 0208 **Evaluation of an Improved Soft Meal Assistive Exoskeleton with an Adjustable Weight-Bearing System for People with Disability....79**
Daegeun Park, Inwook Koo and Kyu-Jin Cho
- 0142 **Impedance and Force-field Control of the Index Finger Module of a Hand Exoskeleton for Rehabilitation....85**
Priyanshu Agarwal and Ashish D. Deshpande
- 0229 **Thumb Joint Angle Estimation for Soft Wearable Hand Robotic Devices....91**
Dong Hyun Kim and Hyung-Soon Park

Lower Lim Exoskeleton

Session III	Lower Lim Exoskeleton
Date/Time	Wednesday, 12 August 2015 / 16:30 - 18:20
Chair	Kjujin Cho, Seoul National University, South Korea
Co-chair	David Braun, Singapore University of Technology and Design, Singapore

- 0030 **Development and Evaluation of a Novel Overground Robotic Walker for Pelvic Motion Support....95**
Kyung-Ryoul Mun, Zhao Guo and Haoyong Yu
- 0039 **Cycle Variance: Proposing a Novel Ensemble-Based Approach to Assess the Gait Rhythmicity on the MIT-Skywalker....101**
Tyler Susko and Hermano Igo Krebs
- 0046 **Intelligent Pneumatic Assisted Therapy on Ankle Rehabilitation....107**
Khairuddin Osman, Ahmad 'Athif Mohd Faudzi, M. F. Rahmat and Koichi Suzumori
- 0103 **ExoOpt --- A Framework for Patient Centered Design Optimization of Lower Limb Exoskeletons....113**
Henning Koch and Katja Mombaur
- 0119 **Design and Control of the Lower Limb Exoskeleton KIT-EXO-1....119**
Jonas Beil, Gernot Perner and Tamim Asfour
- 0152 **Concept of a Soft Exosuit for the Support of Leg Function in Rehabilitation....125**
Volker Bartenbach, Kai Schmidt, Matthias Naef, Dario Wyss and Robert Riener
- 0207 **A Soft Exosuit for Patients With Stroke: Feasibility Study with a Mobile Off-Board Actuation Unit....131**
Jae hyun Bae, Stefano Marco Maria De Rossi, Kathleen O'Donnell, Kathryn L. Hendron, Louis N. Awad, Thiago R. Teles Dos Santos, Vanessa L. De Araujo, Ye Ding, Kenneth G. Holt, Terry D. Ellis and Conor J. Walsh
- 0013 **Walking Pattern Prediction with Partial Observation for Partial Walking Assistance by using an Exoskeleton System....139**
Jan Oskar Brinker, Takamitsu Matsubara, Tatsuya Teramae, Tomoyuki Noda, Tsukasa Ogasawarsa, Tamim Asfour and Jun Morimoto

Robot Aided Rehabilitation

Session IV	Robot Aided Rehabilitation
Date/Time	Thursday, 13 August 2015 / 08:40 - 09:40
Chair	Prof. Marco Santello, Arizona State University, USA
Co-chair	Prof. Hyung-Soon Park, KAIST, South Korea

- 0047 **Objective Assessment of Vibrotactile Mislocalization Using a Haptic Glove....145**
Mike D. Rinderknecht, Raffael Gross, Kaspar Leuenberger, Olivier Lambercy and Roger Gassert
- 0048 **The Role of Skill Level and Motor Task Characteristics on the Effectiveness of Robotic Training: First Results....151**
Laura Marchal-Crespo, Peter Wolf, Nicolas Gerig, Georg Rauter, Lukas Jaeger, Heike Vallery and Robert Riener

- 0079 **Shape Conformable High Spatial Resolution Tactile Bracelet for Detecting Hand and Wrist Activity....157**
Risto Kõiva, Eckard Riedenklau, Carla Viegas and Claudio Castellini
- 0089 **'Feel the Painting' : A Clinician-Friendly Approach to Programming Planar Force Fields for Haptic Devices....163**
Paolo Tommasino, Asif Hussain, Aamani Budhota, Charmayne ML Hughes, Wayne Dailey and Domenico Campolo
- 0140 **An Instrumented Manipulandum for Human Grasping Studies....169**
Alessandro Altobelli, Matteo Bianchi, Manuel G. Catalano, Alessandro Serio, Gabriel Baud-Bovy and Antonio Bicchi
- 0154 **Adaptive Wrist Robot Training in Pediatric Rehabilitation....175**
F. Marini, V. Squeri, A. Riva, L. Cappello, L. Doglio, P. Morasso and L. Masia
- 0132 **Electromyographic Mapping of Finger Stiffness in Tripod Grasp: A Proof of Concept....181**
Matteo Rossi, Alessandro Altobelli, Sasha B. Godfrey, Arash Ajoudani and Antonio Bicchi
- 0065 **Development, Control, and MRI-Compatibility of the MR-SoftWrist....187**
Andrew Erwin, Marcia K. O'Malley, David Ress and Fabrizio Sergi
- 0233 **Evaluation of Force Field Training Customized According to Individual Movement Deficit Patterns....193**
Zachary A. Wright, James L. Patton, Felix C. Huang and Emily Lazzaro

NeuroScience and Brain Machine Interface

Session V	NeuroScience and BMI
Date/Time	Friday, 14 August 2015 / 09:10 - 10:10
Chair	Prof. Juergen Konczac, <i>University of Minnesota, USA</i>
Co-chair	Prof. Patrick Pilarski, <i>University of Alberta, Canada</i>

- 0218 **Feasibility Study on EEG Driven Robotic System to Realize Efficient Stroke Rehabilitation....199**
Kiyoshi Nagai, Takaaki Goto, Takuya Shimizu, Hiroki Dobashi, Koji Ito, Yoshikatsu Hayashi, Rui C. V. Loureiro, Slawomir J. Nasuto and William S. Harwin
- 0190 **Characterization of a Hand-wrist Exoskeleton, READAPT, via Kinematic Analysis of Redundant Pointing Tasks....205**
Chad G. Rose, Fabrizio Sergi, Youngmok Yun, Kaci Madden, Ashish D. Deshpande and Marcia K. O'Malley
- 0131 **Evaluation of Similarities between Robotic Tasks for Reduction of Stroke Assessment Time....211**
S. M. Mostafavi, S. P. Dukelow, S. H. Scott and P. Mousavi
- 0080 **Effects of Combined Transcranial Direct Current Stimulation and Wrist Robot-Assisted Therapy in Subacute Stroke Patients: Preliminary Results....217**
Stefano Mazzoleni, Paolo Dario, Federico Posteraro and Laura Iardella
- 0097 **Brain-machine Interfaces for Motor Rehabilitation: Is Recalibration Important?....223**
Eduardo López-Larraz, Fernando Trincado-Alonso and Luis Montesano
- 0122 **EMG-based Multi-Joint Kinematics Decoding for Robot-Aided Rehabilitation Therapies....229**
Andrea Sarasola-Sanz, Nerea Irastorza-Landa, Farid Shiman, Eduardo López-Larraz, Martin Spüller, Niels Birbaumer and Ander Ramos-Murguialday
- 0123 **Switching Proportional EMG Control of a 3D Endpoint Arm Support for People with Duchenne Muscular Dystrophy....235**
Kostas Nizamis, Joan Lobo-Prat, Arvid Q. L. Keemink, Raffaella Carloni, Arno H.A. Stienen and Bart F. J. M. Koopman
- 0171 **Influence of Trajectory and Speed Profile on Muscle Organization During Robot-Aided Training....241**
Aurélie Sadaka-Stephan, Elvira Pirondini, Martina Coscia and Silvestro Micera

- 0172 **Quantitative Assessment of Motor Deficit with an Intelligent Key Object: A Pilot Study....247**
Asif Hussain, Wayne Dailey, Sivakumar Balasubramanian, Nathanaël Jarrassé, Selvaraj Samuelkamaleshkumar, Suresh Devasahayam and Etienne Burdet
- 0196 **FES-based Upper-Limb Stroke Rehabilitation with Advanced Sensing and Control....253**
Mustafa Kutlu, Chris T. Freeman, Emma Hallewell, Ann-Marie Hughes and Dina Shona Laila

Poster Section

Prosthesis and Orthosis

Poster I	Prosthesis and Orthosis
Date/Time	Wednesday, 12 August 2015 / 10:20 - 11:30

- 0195 **Origami Structured Compliant Actuator (OSCA)....259**
Dongwon Kim and R. Brent Gillespie
- 0095 **Realization of Stair Ascent and Motion Transitions on Prostheses Utilizing Optimization-Based Control and Intent Recognition....265**
Huihua Zhao, Jacob Reher, Jonathan Horn, Victor Paredes and Aaron D. Ames
- 0242 **Lower Leg Trajectory Error: A Novel Optimization Parameter for Designing Passive Prosthetic Feet....271**
Kathryn M. Olesnavage and Amos G. Winter V.
- 0057 **A HMM Distributed Classifier to Control Robotic Knee Module of an Active Orthosis....277**
Juri Taborri, Stefano Rossi, Eduardo Palermo and Paolo Cappa
- 0012 **Dynamic Analysis and Optimization for the Ankle Joint Prosthesis....283**
Haitian Sha, Juan Li, Weida Li, Hongmiao Zhang, Haiyan Hu, Chunguang Li and Hao Guo
- 0082 **Unifying the Gait Cycle in the Control of a Powered Prosthetic Leg....289**
David Quintero, Anne E. Martin and Robert D. Gregg
- 0118 **Robotic Based Simulation Algorithm to Predict Optimized Compensatory Motion of Transradial Prosthesis Users....295**
Dimitrios Menychtas, Stephanie Carey and Rajiv Dubey
- 0160 **Hybrid Kinematic Model Applied to the Under-Actuated Robotic Hand Prosthesis Promain-I and Experimental Evaluation....301**
J. L. Ramirez, A. Rubiano, N. Jouandeau, M. N. El Korso, L. Gallimard and O. Polit
- 0091 **Motion-based Grasp Selection: Improving Traditional Control Strategies of Myoelectric Hand Prosthesis....307**
Marcus Gardner, Ravi Vaidyanathan, Etienne Burdet and Boo Cheong Khoo
- 0204 **Observer-Based Active Impedance Control of a Knee-Joint Assistive Orthosis....313**
Weiguang Huo, Samer Mohammed and Yacine Amirat
- 0244 **Development of a Novel Test Method for Skin Safety Verification of Physical Assistant Robots....319**
Xuewei Mao, Yoji Yamada, Yasuhiro Akiyama, Shogo Okamoto and Kengo Yoshida
- 0099 **Analyzing and Considering Inertial Effects in Powered Lower Limb Prosthetic Design....325**
Philipp Beckerle, Janis Wojtusch, André Seyfarth, Oskar von Stryk and Stephan Rinderknecht
- 0192 **State of the Art in Prosthetic Wrists: Commercial and Research Devices...331**
Neil M. Bajaj, Adam J. Spiers and Aaron M. Dollar
- 0010 **Wrist and Grasp Myocontrol: Simplifying the Training Phase....339**
Markus Nowak and Claudio Castellini
- 0203 **Comparison of Reaction Times While Walking....345**
Iris Jiang and Blake Hannaford
- 0178 **Design of a Fully Passive Prosthetic Knee Mechanism for Transfemoral Amputees in India....350**
V. N. Murthy Arelekatti and Amos G. Winter V.

- 0078 **User Requirements for Assistance of the Supporting Hand in Bimanual Daily Activities via a Robotic Glove for Severely Affected Stroke Patients....357**
G. B. Prange, L. C. Smulders, J. van Wijngaarden, G. J. Lijbers, S. M. Nijenhuis, P. H. Veltink, J. H. Buurke and A. H. A. Stienen
- 0014 **Model Reference Adaptive Control Using a Neural Compensator to Drive an Active Knee Joint Orthosis....362**
B. Daachi, T. Madani, M. E. Daachi and K. Djouani
- 0155 **From Gait Measurements to Design of Assistive Orthoses for People with Neuromuscular Diseases....368**
A. Ortlieb, J. Olivier, M. Bouri, H. Bleuler and T. Kuntzer
- 0110 **Design of Powered Ankle-Foot Prosthesis Driven by Parallel Elastic Actuator....374**
Fei Gao, Wei-Hsin Liao, Hao Ma, Lai-Yin Qin and Bing Chen
- 0056 **Customizable Soft Pneumatic Finger Actuators for Hand Orthotic and Prosthetic Applications....380**
Jin-Huat Low, Ang Marcelo H. Jr. and Chen-Hua Yeow
- 0043 **A Novel Adaptive Oscillators-Based Control for a Powered Multi-Joint Lower-Limb Orthosis....386**
Tingfang Yan, Andrea Parri, Matteo Fantozzi, Mario Cortese, Marco Muscolo, Marco Cempini, Francesco Giovacchini, Guido Pasquini, Marko Munih and Nicola Vitiello
- 0115 **Real-time Gait Phase Detection and Estimation of Gait Speed and Ground Slope for a Robotic Knee Orthosis....392**
Jinsoo Kim, Seung-Jong Kim and Junho Choi
- 0180 **Combined Active Wrist and Hand Orthosis for Home Use: Lessons Learned....398**
Serdar Ates, Israel Mora-Moreno, Martijn Wessels and Arno H. A. Stienen
- 0019 **Direct Effect of a Dynamic Wrist and Hand Orthosis on Reach and Grasp Kinematics in Chronic Stroke....404**
S. M. (Sharon) Nijenhuis, G. B. (Gerdienke) Prange, A. H. A. (Arno) Stienen, J. H. (Jaap) Buurke and J. S. (Hans) Rietman
- 0113 **CYBERLEGS Beta-Prosthesis Active Knee System....410**
Louis Flynn, Joost Geeroms, Rene Jimenez-Fabian, Bram Vanderborght and Dirk Lefebvre
- 0157 **Multi-Directional Impedance Control with Electromyography for Compliant Human-Robot Interaction....416**
Mark Ison and Panagiotis Artemiadis

Upper Limb Exoskeleton and Lower Lim Exoskeleton

Poster II	Upper Limb Exoskeleton and Lower Limb Exoskeleton
Date/Time	Wednesday, 12 August 2015 / 15:30 - 16:30

- 0235 **Compliant Motion Control for a Compliant Rehabilitation System....422**
Dongwon Kim
- 0139 **Static and Dynamic Characterization of the LIGHTarm Exoskeleton for Rehabilitation....428**
Alessandro Scano, Giulio Spagnuolo, Marco Caimmi, Andrea Chiavenna, Matteo Malosio, Giovanni Legnani and Lorenzo Molinari Tosatti
- 0009 **Development of an Anatomical Wrist Therapy Exoskeleton (AW-TEX)....434**
Andrew J. McDaid
- 0150 **Passive and Active Gravity-compensation of LIGHTarm, an Exoskeleton for the Upper-limb Rehabilitation....440**
Giulio Spagnuolo, Matteo Malosio, Alessandro Scano, Marco Caimmi, Giovanni Legnani and Lorenzo Molinari Tosatti
- 0136 **Directional Stiffness Attachment Design for an Upper Limb Exoskeleton....446**
A. B. W. Miranda, T. H. Coelho, A. Forner-Cordero and A. A. G. Siqueira
- 0145 **Discrete Classification of Upper Limb Motions Using Myoelectric Interface....451**
Chris Wilson Antuvan, Federica Bisio, Erik Cambria and Lorenzo Masia

- 0238 **Phase-dependent Control of an Upper-limb Exoskeleton for Assistance in Self-feeding....457**
Li Lei, Ang Wei Tech, Christopher Kuah, Rengaswamy Marimuthu, Ramadass Muruganandam and Win Tun Latt
- 0015 **A Close-to-Body 3-Spring Configuration for Gravity Balancing of the Arm....464**
A. G. Dunning and J. L. Herder
- 0067 **Control Implementation of Compliant Composite Material Actuators for Wearable Robotic Exoskeleton....470**
Binh Khanh Dinh, Leonardo Cappello and Lorenzo Masia
- 0114 **Adaptive Gravity and Joint Stiffness Compensation Methods for Force-Controlled Arm Supports....478**
Joan Lobo-Prat, Arvid Q. L. Keemink, Bart F. J. M. Koopman, Arno H. A. Stienen and Peter H. Veltink
- 0209 **Design of a Hand Exoskeleton for Biomechanical Analysis of the Stroke Hand....484**
Jeongsoo Lee and Joonbum Bae
- 0185 **Exploring Laparoscopic Surgery Training with Cable-driven ARm EXoskeleton (CAREX-M)....490**
Xin Jin and Sunil K. Agrawal
- 0126 **Development of Upper-extremity Exoskeleton driven by Pneumatic Cylinder toward Robotic Rehabilitation Platform for Shoulder Elevation....496**
Tomoyuki Noda and Jun Morimoto
- 0060 **User-centred Input for a Wearable Soft-Robotic Glove Supporting Hand Function in Daily Life....502**
B. Radder, A. I. R. Kottink, N. van der Vaart, D. Oosting, J. H. Buurke, S. M. Nijenhuis, G. B. Prange and J. S. Rietman
- 0134 **Towards a multi-DOF Passive Balancing Mechanism for Upper Limbs....508**
Zhuoqi Cheng, Shaohui Foong, Defeng Sun and U-Xuan Tan,c
- 0033 **Teleoperation of Two Six-degree-of-freedom Arm Rehabilitation Exoskeletons....514**
Jessica Lanini, Toshiaki Tsuji, Peter Wolf, Robert Riener and Domen Novak
- 0016 **Feasibility Study of an Upper Arm Support based on Bending Beams....520**
A. G. Dunning, J. L. Stroo, G. Radaelli, and J. L. Herder
- 0161 **Assistive Robotic Manipulation through Shared Autonomy and a Body-Machine Interface....526**
Siddarth Jain, Ali Farshchiansadegh, Alexander Broad, Farnaz Abdollahi, Ferdinando Mussa-Ivaldi and Brenna Argall
- 0146 **Dynamic Modeling and Control of a Parallel Upper-limb Rehabilitation Robot....532**
Liang Peng, Zeng-Guang Hou and Weiqun Wang
- 0187 **Controls for the Shoulder Mechanism of an Upper-Body Exoskeleton for Promoting Scapulohumeral Rhythm....538**
Bongsu Kim and Ashish D. Deshpande
- 0243 **SMAFO: Stiffness Modulated Ankle Foot Orthosis for a Patient with Foot Drop....543**
Gwang Min Gu, Seulki Kyeong, Dae-Sung Park and Jung Kim
- 0029 **Performance Evaluation of Lower Limb Ambulatory Measurement Using Reduced Inertial Measurement Units And 3R Gait Model....549**
Xinyao Hu, Cheng Yao and Gim Song Soh
- 0050 **Analysis of the Anklebot Training as a Method for Reducing Lower-Limb Paretic Impairment : A Case Study in Electromyography....555**
Krithika Swaminathan and Hermano Igo Krebs
- 0024 **Muscle Activity Restriction Taping Technique Simulates the Reduction in Foot-Ground Clearance in the Elderly....559**
Jessica Beltran Ullauri, Yasuhiro Akiyama, Naomi Yamada, Shogo Okamoto and Yoji Yamada
- 0206 **A Walking Assistive Device with Intention Detection using Back-driven Pneumatic Artificial Muscles....565**
Takahiro Kanno, Daisuke Morisaki, Ryoken Miyazaki, Gen Endo and Kenji Kawashima
- 0028 **A Novel Gait Phase-based Control Strategy for a Portable Knee-ankle-foot Robot....571**
Gong Chen, Veena Salim and Haoyong Yu

- 0129 **Design of a Novel Assist Interface where Toddlers Walk with a Mobile Robot Supported at the Waist....577**
N. Jin, J. Kang and S. K. Agrawal
- 0147 **Conceptual Design of a Novel Variable Stiffness Actuator for Use in Lower Limb Exoskeletons....583**
Tomislav Bacek, Ramazan Unal, Marta Moltedo, Karen Junius, Heidi Cuypers, Bram Vanderborght and Dirk Lefebre
- 0236 **Study on the use of Soft Ankle-Foot Exoskeleton for Alternative Mechanical Prophylaxis of Deep Vein Thrombosis....589**
Fan-Zhe. Low, Raye C. H. Yeow, Hong Kai. Yap and Jeong Hoon. Lim
- 0141 **ASSISTON-GAIT: An Overground Gait Trainer with an Active Pelvis-Hip Exoskeleton....594**
Hammad Munawar, Mustafa Yalcin and Volkan Patoglu
- 0144 **A Lower Limb Exoskeleton Research Platform to Investigate Human-Robot Interaction....600**
Volker Bartenbach, Dario Wyss, Dominique Seuret and Robert Riener
- 0197 **Real-time Physical Layer Architecture for CORBYS Gait Rehabilitation Robot....606**
Victor Grosu, Carlos Rodriguez Guerrero, Svetlana Grosu, Adrian Leu, Danijela Ristic-Durrant, Bram Vanderborght and Dirk Lefebre
- 0165 **Crutch Tip for Swing-through Crutch Walking Control Based on a Kinetic Shape....612**
Daniel Capecci, Seok Hun Kim, Kyle B. Reed, Ismet Handžić
- 0062 **Impact of Ankle Locking on Gait: Implications for the Design of Hip and Knee Exoskeletons....618**
J. Olivier, A. Ortlieb, P. Bertusi, T. Vouga, M. Bouri and H. Bleuler

Robot Aided Rehabilitation I

Poster IV	Robot Aided Rehabilitation I
Date/Time	Thursday, 13 August 2015 / 09:40 - 10:40

- 0210 **Accelerating Motor Adaptation by Virtual Reality Based Modulation of Error Memories....623**
Belén Rubio Ballester, Laura Serra Oliva, Armin Duff and Paul Verschure
- 0125 **A Novel Assist-as-Needed Control Method to Guide Pelvic Trajectory for Gait Rehabilitation....630**
Jiyeon Kang, Vineet Vashista and Sunil K. Agrawal
- 0170 **Locomotor Adaptations Following Repeated Waist-pull Perturbations....636**
Dario Martelli, Vineet Vashista, Silvestro Micera and Sunil K. Agrawal
- 0211 **Guidance in the Nullspace Reduces Task Difficulty in Robot-Assisted Coordination Training....642**
A. Waeber, N. Gerig, K. Baur, H. Vallery, P. Lutz, R. Riener, A. Curt, M. Bolliger and G. Rauter
- 0040 **Robotic Driving Assistance System for Manual Wheelchair User on Uneven Ground....648**
Daisuke Chugo, Nobuhiko Goto, Sho Yokota, Satoshi Muramatsu and Hiroshi Hashimoto
- 0174 **Quantitative Motor Assessment of Upperlimb after Unilateral Stroke: A Preliminary Feasibility Study with H-Man, a Planar Robot....654**
Asif Hussain, Wayne Dailey, Charmayne Hughes, Aamani Budhota, W. G. Kumudu C. Gamage, Deshmukh Arun Vishwanath, Chris Kuah, Karen Chua, Etienne Burdet and Domenico Campolo
- 0133 **Towards Perception Driven Robot-assisted Task-oriented Therapy....660**
Addwiteey Chrungoo, Priyanka Shirsat and Michelle J. Johnson
- 0227 **Design and Concept of a Haptic Robotic Telerehabilitation System for Upper Limb Movement Training after Stroke....666**
Ekaterina Ivanova, Jörg Krüger, Robert Steinräber, Simone Schmid, Henning Schmidt and Stefan Hesse
- 0246 **A Wearable Sensor System for Rehabilitation Applications....672**
Gautam Sadarangani and Carlo Menon
- 0194 **Case Study of Patients Participating in a Randomised Controlled Trial of Upper-Limb Robotic Rehabilitation in Acute Stroke Services....678**
A. E. Jackson, M. C. Levesley, S. G. Makower, J. A. Cozens and R. J. O'Connor

- 0003 **Development of an Add-on Drive Mechanism for Improving Motion Performance of a Manual Wheelchair....684**
Yu Munakata and Masayoshi Wada
- 0052 **Real-time Gait Assessment with an Active Depth Sensor Placed in a Walker....690**
Martins Martins, Cristina P. Santos, Solenne Page, Ludovic Saint-Bauzel, Viviane Pasqui and Anthony Mézière
- 0193 **Focal Vibro-Tactile Stimulation as a Pre-Conditioner to Enhance Muscle Performance in Robot-Mediated Neurorehabilitation....696**
Tijana Jevtic, Aleksandar Zivanovic and Rui C. V. Loureiro
- 0234 **Can Anti-spastic Medication Facilitate Robotic-Locomotor Training?....702**
Mehdi M. Mirbagheri and Lynsey D. Duffell
- 0181 **Assessment-Driven Arm Therapy at Home Using an IMU-Based Virtual Reality System....707**
Frieder Wittmann, Olivier Lambercy, Roman R. Gonzenbach, Mark A. van Raai, Raphael Höverz, Jeremia Held, Michelle L. Starkey, Armin Curt, Andreas Luft and Roger Gassert
- 0228 **Development of a Passive Shoulder Joint Tracking Device for Upper Limb Rehabilitation Robots....713**
Jeong-Ho Park, Kyoung-Soub Lee, Hangil Lee and Hyung-Soon Park
- 0092 **An End-effector Arm Rehabilitation Robot with VE....717**
Natthapong Angsupasirikul and Ratchatin Chancharoen
- 0162 **Assist-as-needed Ankle Rehabilitation based on Adaptive Impedance Control....723**
Juan C. Pérez-Ibarra, Adriano A. G. Siqueira and Hermano I. Krebs
- 0021 **Adaptive Assistive Control of a Soft Elbow Trainer with Self-Alignment using Pneumatic Bending Joint....729**
André Wilkening, Henning Stöppler and Oleg Ivlev
- 0108 **MRC-Glove: A fMRI Compatible Soft Robotic Glove for Hand Rehabilitation Application....735**
Hong Kai. Yap, Jeong Hoon. Lim, Fatima. Nasrallah, Fan-Zhe. Low, James C.H. Goh and Raye C. H. Yeow
- 0074 **Ankle Training Robot Force Visualization for Eccentric Contraction Training....741**
Shota Itoh, Masashi Sekiya, Kunihiro Ogata and Toshiaki Tsuji
- 0164 **Development of a Wearable Assistive Soft Robotic Device for Elbow Rehabilitation....747**
Victoria Oguntosin, William S. Harwin, Sadao Kawamura, Slawomir J. Nasuto and Yoshikatsu Hayashi
- 0051 **Dynamics of the Mobile Robotic Balance Trainer : Study of the Pentagonal Closed Chain Properties in relation with Balance Tasks....753**
Carlo Tiseo, Wei Tech Ang and Cheng Yap Shee
- 0061 **Gait Performance Indicators for Elderly Humans interacting with Robotic Mobility Assistance Devices....758**
Khai-Long Ho Hoang, Davide Corradi, Sascha Delbasteh and Katja Mombaur

Robot Aided Rehabilitation II

Poster IV	Robot Aided Rehabilitation II
Date/Time	Thursday, 13 August 2015 / 11:30 - 12:30

- 0088 **Effects of Comparative Feedback from a Socially Assistive Robot on Self-Efficacy in Post-Stroke Rehabilitation....764**
Katelyn Swift-Spong, Elaine Short, Eric Wade and Maja J Matarić
- 0205 **Assessment of Upper Limb Movement with an Autonomous Robotic Device in a School Environment for Children with Cerebral Palsy....770**
Justin Gallagher, Nick Preston, Raymond Holt, Mark Mon-Williams, Martin Levesley and Andrew Weightman
- 0017 **Effects of Robot-Assisted Locomotor Training in Patients with Gait Disorders Following Neurological Injury: An Integrated EMG and Kinematic Approach....775**
S. Mazzoleni, E. Battini, G. Stampacchia and T. Tombini

- 0066 **Paediatric Robotic Gait Trainer for Children with Cerebral Palsy....780**
Andrew J. McDaid, Chatchawan Lakkhananukun and Jun Park
- 0166 **A Novel Power Add-on Unit for Attendant Propelled Wheelchairs with Sensorless Speed Control and Power Assistance....786**
Chi Zhu, Takeru Nakayama, Masashi Shibayama, Masataka Yoshioka, Hongbo Liang Yuling Yan, Haoyong Yu, Jun Nakajima and Hideya Shibasaki
- 0059 **Comparison of Flexible and Rigid Hand-Grip Control During a Feed-Forward Visual Tracking Task....792**
Michael Mace, Paul Rinne, Jean-Luc Liardon, Paul Bentley and Etienne Burdet
- 0105 **A Computer Model of the Human Arm: Predictive Biomechanics for the TheraDrive Rehabilitation System....798**
Dayo O. Adewole and Michelle J. Johnson
- 0199 **Robot-Aided Assessment of Walking Function Based on an Adaptive Algorithm....804**
Serena Maggioni, Lars Liinenburger, Robert Riener, Alejandro Melendez-Calderon
- 0240 **A Six-Degree-of-Freedom Robotic System for Lower Extremity Rehabilitation....810**
Aaron Yurkewich, S. Farokh Atashzar, Ahmed Ayad and Rajni V. Patel
- 0090 **Visualization of Shoulder Range of Motion for Clinical Diagnostics and Device Development....816**
Arno H. A. Stienen and Arvid Q. L. Keemink
- 0179 **Robot-assisted Learning for Communication-care in Autism Intervention....822**
Syamimi Shamsuddin, Hanafiah Yussof, Fazah Akhtar Hanapiah, Salina Mohamed, Nur Farah Farhana Jamil and Farhana Wan Yunus
- 0212 **Interactive Behavior Design in Humanoid Robot Towards Joint Attention of Children with Cerebral Palsy with Human Therapists....828**
Norjasween Abdul Malik, Hanafiah Yussof and Fazah Akhtar Hanapiah
- 0223 **Effects of Robotic Exoskeleton Dynamics on Joint Recruitment in a Neurorehabilitation Context....834**
Justin Fong, Vincent Crocher, Denny Oetomo, Ying Tan and Iven Mareels
- 0085 **Design of a Parallel-Group Balanced Controlled Trial to Test the Effects of Assist-As-Needed Robotic Therapy....840**
Fabrizio Sergiy, Ali Utku Pehlivan, Kyle Fittle, Kathryn Nedley, Nuray Yozbatiran, Gerard E. Francisco and Marcia K. O'Malley
- 0202 **Performance Comparison of Interaction Control Strategies on a Hand Rehabilitation Robot....846**
Jean-Claude Metzger, Olivier Lambercy and Roger Gassert
- 0036 **Smart Walker use for Ataxia's Rehabilitation: Case Study....852**
Maria Martins, Cristina P. Santos, Anselmo Frizera, Ana Matias, Tânia Pereira, Maria Cotter and Fátima Pereira
- 0220 **Towards a Bio-Inspired Control Strategy for Bilateral Stroke Rehabilitation based on Motor Control Principles....858**
Anushree Singh, Roshan Rai and Michelle J. Johnson
- 0041 **Preliminary Testing of the Fully-Integrated Cognitive Controlled Walking Rehabilitation System....864**
Imre Cikajlo, Matjaz Zadravec, Andrej Olensek and Zlatko Matjacic
- 0219 **Assessing Human-Human Therapy Kinematics for Retargeting to Human-Robot Therapy....870**
Michelle J. Johnson, Seethu M. Christopher, Mayumi Mohan and Rochelle Mendonca
- 0200 **Neurorehabilitation Robot System for Neurological Patients using H-Infinity Impedance Controller....876**
Wooram Kim, Dongbock Lee, Deokwon Yun, Younghoon Ji, Minsung Kang, Jungsoo Han and Changsoo Han
- 0004 **Control of Mobility Assistive Robot for Human Fall Prevention....882**
Milad Geravand, Wolfgang Rampeltshammer and Angelika Peer
- 0072 **Kinematic Reconstruction of the Upper Limb Joints in Planar Robot-Aided Therapies....888**
Arturo Bertomeu-Motos, Ricardo Morales, Jorge A. Díez, Luis D. Lledó, Francisco J. Badesa and Nicolas Garcia-Aracil

- 0153 **Proprioceptive Assessment of the Wrist Joint Across Both Joint Degrees of Freedom....894**
A. Cuppone, V. Squeri, M. Semprini and J. Konczak
- 0191 **A Feasibility Study to Assess Intralimb Coordination in Stroke Rehabilitation: Two Indices of Mechanical Impedance by Coactivation of Agonist Muscles....899**
Takanori Oku, Kanna Uno, Tomoki Nishi, Masayuki Kageyama, Keitaro Koba, Mitsunori Uemura, Hiroaki Hirai, Fumio Miyazaki, Hiroaki Naritomi

NeuroScience and Brain Machine Interface

Poster V	NeuroScience and BMI
Date/Time	Friday, 14 August 2015 / 10:10 - 11:10

- 0232 **Brain-Controlled Wheelchair based EEG-SSVEP Signals Classified by Nonlinear Adaptive Filter....905**
Arjon Turnip, M. Agung Suhendra and W. S. Mada Sanjaya
- 0245 **Using Mini Minimum Jerk Model for Human Activity Classification in Home-Based Monitoring....909**
Mostafa Ghobadi, Jacob Sosnoff, Thenkurussi Kesavadas and Ehsan T. Esfahani
- 0025 **Reaching Contralateral Target by Chronic Hemiparetic Stroke Survivors using Active-Assisted/Active Exercise with 2D/3D Visual Feedback....913**
Won-Kyung Song, Ki-Hun Cho, Ji Young Jeong, Yale Kim, Jung Yoon Kim and Joon-Ho Shin
- 0189 **Muscle Innervation Patterns for Human Wrist Control: Useful Biofeedback Signals for Robotic Rehabilitation?....919**
M. Semprini, A. Cuppone, V. Squeri and J. Konczak
- 0037 **Robotic Assay of Arm Reaching Movements in Diverse Neurologic Populations: Can Movement Features Be Reliable, Disease-Specific Diagnostic Biomarkers?....925**
Christine Y. Kang, Susan S. Conroy, Anindo Roy and Christopher T. Bever
- 0130 **Online Brain-Computer Interface Controlling Robotic Exoskeleton for Gait Rehabilitation....931**
Kai Gui, Yong Ren and Dingguo Zhang
- 0023 **OMG: Introducing Optical Myography as a New Human Machine Interface for Hand Amputees....937**
Christian Nissler, Nikoleta Mouriki, Claudio Castellini, Vasileios Belagiannis and Nassir Navab
- 0127 **Processing of sEMG Signals for Online Motion of a Single Robot Joint through GMM Modelization....943**
Riccardo Valentini, Stefano Michieletto, Fabiola Spolaor, Zimi Sawacha and Enrico Pagello
- 0182 **Adaptive Therapy Strategies: Efficacy and Learning Framework....950**
Hee-Tae Jung, Richard G. Freedman, Takeshi Takahashi, Jay Ming Wong, Shlomo Zilberstein, Roderic A. Grupen and Yu-kyong Choe
- 0169 **Decoding Force from Multiunit Recordings from the Median Nerve....956**
James Wright, Vaughan G. Macefield, André van Schaik and Jonathan Tapson
- 0231 **Influence of Visual Information on Bimanual Haptic Manipulation....961**
Sara Contu, Charmayne Hughes and Lorenzo Masia
- 0006 **An fMRI Pilot Study Evaluating Brain Activation During Different Finger Training Exercises....967**
Zhenjin Tang, Hiroyasu Iwata and Shigeki Sugano
- 0034 **Effects of Reserve Actuators on Optimization Solutions: From Muscle Force to Joint Stiffness....973**
Roberto Bortoleto, Enrico Pagello and Davide Piovesan
- 0117 **Design and Comparative Evaluation of a BCI-based Upper Extremity Robotic Rehabilitation Protocol....979**
Ela Koyas, Mine Sarac, Mujdat Cetin and Volkan Patoglu
- 0167 **Analysis and Optimization of Novel Post-processing Method for Myoelectric Pattern Recognition....985**
Masahiro Kasuya, Hiroshi Yokoi and Ryu Kato
- 0109 **A Preliminary Study of Force Estimation Based on Surface EMG: Towards Neuromechanically Guided Soft Oral Rehabilitation Robot....991**
Haibo Yu, Yi Sun, Fengjun Bai and Hongliang Ren
- 0226 **A Passive Estimator of Functional Degradation in Power Mobility Device Users....997**

James Poon, Jaime Valls Miro and Ross Black

- 0007 **Detecting Motion Intention in Stroke Survivors Using Autonomic Nervous System Responses....1003**
Laura Marchal-Crespo, Domen Novak, Raphael Zimmerman, Olivier Lambercy, Roger Gassert and Robert Riener
- 0053 **Recognition of Gait Impairment Evaluated Using an Artificial Gait Stimuli....1008**
Ismet Handžić and Kyle B. Reed
- 0111 **Motor Learning Transfer from Isometric to Dynamic Reaching....1014**
Jeesu Baek and Allison Okamura
- 0093 **Expliciting SSVEP Misclassifications With Extra-Brain Activities Using Time-Frequency EEG Analysis....1020**
Boubaker Daachi, Pierre Gergondet, Larbi Boubchir and Abderrahmane Kheddar