

2011 IEEE International Conference on Rehabilitation Robotics

(ICORR 2011)

**Zurich, Switzerland
29 June – 1 July 2011**

Pages 1-558



**IEEE Catalog Number: CFP11CRR-PRT
ISBN: 978-1-4244-9863-5**

TABLE OF CONTENTS

Program Booklet.....	1
<i>N/A</i>	
An Active Foot Lifter Orthosis Based on a PCPG Algorithm.....	92
<i>M. Duvinage, R. Jimenez-Fabian, T. Castermans, O.Verlinden, T. Dutoit</i>	
Proof of Concept to Fan Artificial Muscle-Theoretical Model, Numerical Model, and Hardware Experiment.....	99
<i>D.F.B. Haeufle, M. Günther, R. Blickhan, S. Schmitt</i>	
Multi-Day Training with Vibrotactile Feedback for Virtual Object Manipulation.....	105
<i>Q. An, Y. Matsuoka, C.E. Stepp</i>	
Online Human Training of a Myoelectric Prosthesis Controller via Actor-Critic Reinforcement Learning.....	110
<i>P.M. Pilariski, M.R. Dawson, T. Degris, F. Fahimi, J.P. Carey, R.S. Sutton</i>	
Shoulder RO, an Alignment-Free Two-DOF Rehabilitation Robot for the Shoulder Complex	117
<i>B. Dehez, J. Sapin</i>	
An EMG-Driven Exoskeleton Hand Robotic Training Device on Chronic Stroke Subjects	125
<i>N.S.K. Ho, K.Y. Tong, X.L. Hu, K.L. Fung, X.J. Wei, W. Rong, E.A. Susanto</i>	
A Haptic and Auditory Assistive User Interface-Helping the Blinds on their Computer Operations	130
<i>V. Jaijongrak, I. Kumazawa, S. Thiemjarus</i>	
An Exoskeleton Using Controlled Energy Storage and Release to Aid Ankle Propulsion	136
<i>M. Bruce Wiggan, G.S. Sawicki, S.H. Collins</i>	
Using an Embedded Reality Approach to Improve Test Reliability for NHPT Tasks.....	141
<i>M. Bowler, F. Amirabdollahian, K. Dautenhahn</i>	
Development of a Parametric Kinematic Model of the Human Hand and a Novel Robotic Exoskeleton	148
<i>T. M. W. Burton, R. Vaidyanathan, S. C. Burgess, A. J. Turton, C. Melhuish</i>	
Estimation of IMU and MARG Orientation using a Gradient Descent Algorithm.....	155
<i>S.O.H. Madgwick, A.J.L. Harrison, R. Vaidyanathan</i>	
Knee Orthopaedic Device, How Robotic Technology Can Improve Outcome in Knee Rehabilitation	162
<i>A. Koller-Hodac, D. Leonardo, S. Walpen, D. Felder</i>	
Upper Limb Assessment Using a Virtual Peg Insertion Test.....	168
<i>M.-C. Fluet, O. Lamercy, R. Gassert</i>	
A Small-Scale Robotic Manipulandum for Motor Training in Stroke Rats	174
<i>B. Vigar, O. Lamercy, L. Graber, Rene Fluit, P. Wespe, M. Schubring-Giese, A. Luft, R. Gassert</i>	
Variable Stiffness Structure for Limb Attachment.....	181
<i>M. Bureau, T. Keller, J. Perry, R. Velik, J. F. Veneman</i>	
Assistance Using Adaptive Oscillators-Robustness to Errors in the Identification of the Limb Parameters	186
<i>M.D. Rinderknecht, F.A. Delaloye, A. Crespi, R. Ronsse, A. J. Ijspeert</i>	
Oscillator-Based Walking Assistance –a Model-Free Approach	192
<i>R. Ronsse, B. Koopman, N. Vitiello, T. Lenzi, S. M. M. De Rossi, J. van den Kieboom, E. van Asseldonk, M. C. Carrozza, H. van der Kooij, A. J. Ijspeert</i>	
Synchronized Coordination Walking with Impact-less Footpad Contact of an Overground Gait Rehabilitation System-NATUre-gaits	198
<i>P. Wang, K.H. Low, A. Tow</i>	
Modulation of Weight Off-loading Level over Body-weight Supported Locomotion Training	204
<i>Maria Chiara Carrozza, Herman van der Kooij, and Auke Jan Ijspeert</i>	
Design of a Novel Mobility Device Controlled by the Feet Motion of a Standing Child	210
<i>Z.R. Schoepflin, X. Chen, C.B. Ragonese, J. C. Galloway, S. K. Agrawal</i>	
Design of a Rotary Passive Viscoelastic Joint for Wearable Robots.....	216
<i>G. Carpino, D. Accoto, M. Di Palo, N. L. Tagliamonte, F. Sergi, E. Guglielmelli</i>	
A New Dynamic Model of the Manual Wheelchair for Straight and Curvilinear Propulsion	222
<i>F. Chenier, P. Bigras, R. Aissaoui</i>	
Assessing the Quality and Quantity of Social Interaction in a Socially Assistive Robot-Guided Therapeutic Setting	227
<i>E. Wade, J. Dye, R. Mead, M. J. Matari</i>	
Tongue Motion-Based Operation of Support System for Paralyzed Patients.....	233
<i>J. TAKAHASHI, S. SUEZAWA, Y. HASEGAWA, Y. SANKAI</i>	
On the Development of a Walking Rehabilitation Device with a Large Workspace.....	239
<i>C. Gosselin, T. Laliberté</i>	

Assistive Control of Motion Therapy Devices Based on Pneumatic Soft-Actuators with Rotary Elastic Chambers	245
<i>A. Wilkening, D. Baiden, O. Ivlev</i>	
A Depressurization Assistance Control Based on the Posture of a Seated Patient on a Wheelchair	251
<i>D. Chugo, K. Fujita, Y. Sakaida, K. Takase, S. Yokota</i>	
INS-EKF Based Stride Length, Height and Direction Intent-Detection for Walking Assistance Robots	257
<i>D. Brescianini, J. Jung, I.-H. Jang, H.S. Park, R. Riener</i>	
Miro Semi-Autonomous Competency Assessment of Powered Mobility Device Users.....	262
<i>J.V. Miro, R. Black, F. De Drujijn, G. Dissanayake</i>	
Walking and Sit-to-Stand Support System for Elderly and Disabled	268
<i>H.G. Jun, Y.Y. Chang, B.J. Dan, H. Yang, W.K. Song, J. Kim</i>	
Biomechanical Considerations in the Design of Lower Limb Exoskeletons	273
<i>M. Cenciari, A.M. Dollar</i>	
Clinical Effects of Combined Bilateral Arm Training with Functional Electrical Stimulation in Patients with Stroke.....	279
<i>F.-C. Wu, Y.-T. Lin, T.-S. Kuo, J.-J. Luh, J.-S. Lai</i>	
Preliminary Results of Online Classification of Upper Limb Motions from Around-Shoulder Muscle Activities.....	286
<i>H. Soma, Y. Horiuchi, J. Gonzalez, W. Yu</i>	
Improving Valid and Deficient Body Segment Coordination to Improve FES-Assisted Sit-to-Stand in Paraplegic Subjects.....	292
<i>J. Jovic, P. Fraisse, C.A. Coste, V. Bonnet, C. Fattal</i>	
Enhancing Functional Electrical Stimulation for Emerging Rehabilitation Robotics in the Framework of Hyper Project.....	297
<i>F. Brunetti, A. Garay, J.C. Moreno, J.L. Pons</i>	
An fMRI Pilot Study to Evaluate Brain Activation Associated with Locomotion Adaptation.....	303
<i>L. Marchal-Crespo, S. Kollias, R. Riener, C. Hollnagel, M. Brtigger</i>	
Multijoint Arm Stiffness During Movements Following Stroke-Implications for Robot Therapy	310
<i>D. Piovesan, M. Casadio, F.A. Mussa-Ivaldi, P.G. Morasso</i>	
Improving Robotics for Neuro-rehabilitation – Enhancing Engagement, Performance, and Learning with Auditory Feedback.....	317
<i>G. Rosati, D.J. Reinkensmeyer, F. Avanzini, S. Masiero</i>	
Influence of reaching direction on Visuo Motoradaptation – an Explorative Study.....	323
<i>B.I. Molier, E.H.F. van Asseldonk, G.B. Prange, J.H. Buurke</i>	
Adaptive Regulation of Assistance ‘as Needed’ in Robot-Assisted Motor Skill Learning and Neuro-rehabilitation.....	328
<i>V. Squeri, A. Basteris, V. Sanguineti</i>	
Startle Reduces Recall of a Recently Learned Internal Model	334
<i>Z. Wright, J.L. Patton, V. Ravichandran</i>	
Preliminary Results of BRAVO Project	340
<i>M. Bergamasco, A. Frisoli, M. Fontana, M. Troncossi, M. M. Fomashi, V. Parenti-Castelli, C. Loconsole, D. Leonardis</i>	
Clinical Training and Competency Guidelines for Using Robotic Devices.....	347
<i>K. Brady, J. Hidler, D. Nichols, S. Ryerson, J. Hidler</i>	
Locomotor Adaptation and Retention to Gradual and Sudden Dynamic Perturbations	352
<i>E. van Asseldonk, B. Koopman, H. Van der Kooij</i>	
Task Difficulty Adjustment in Biocooperative Rehabilitation Using Psychophysiological Responses	357
<i>D. Novak, M. Mihelj, J. Zihlerl, A. Olenšek, M. Munih</i>	
From Training to Robot Behavior-Towards Custom Scenarios for Robotics in Training Programs for ASD.....	363
<i>J.C.C. Gillesen, E.I. Barakova, B.E.B.M. Huskens, L.M.G. Feijs</i>	
Use of an Electromyographically Driven Hand Orthosis for Training After Stroke	370
<i>J.M. Ochoa, M. Listenberger, D.G. Kamper, S.W. Lee</i>	
Walking after Partial Paralysis Assisted with EMG-Triggered or Switch-Triggered Functional Electrical Stimulation.....	375
<i>A. Dutta, R. Kobetic, R. Triolo</i>	
Body Machine Interface-Remapping Motor Skills after Spinal Cord Injury.....	381
<i>M. Casadio, A. Pressman, S. Acosta, Z. Danzinger, A. Fishbach, F. A. Mussa-Ivaldi, K. Muir, H. Tseng, D. Chen</i>	
Towards Brain-Robot Interfaces for Stroke Rehabilitation	387
<i>M. Gomez-Rodriguez, M. Grosse-Wentrup, J. Hill, A. Gharabaghi, B. Scholkopf, J. Peters</i>	

Development and Evaluation of an Assistive Computer Interface by SEMG for Individuals with Spinal Cord Injuries	393
<i>C. Choi, B.C. Rim, J. Kim</i>	
iHand Rehab-an Interactive Hand Exoskeleton for Active and Passive Rehabilitation	398
<i>J. Li, R. Zheng, Y. Zhang, J. Yao</i>	
Bimanual Shoulder Flexion System with Surface Electromyography for Hemiplegic Patients after Stroke-A Preliminary Study	404
<i>K. Park, S. Kwon, J. Kim</i>	
Robotic Arm Skate for Stroke Rehabilitation	410
<i>C.K. Wong, K. Jordan, M. King</i>	
An Upper-Limb Power-Assist Robot with Tremor Suppression Control	416
<i>K. Kiguchi, Y. Hayashi, T. Asami</i>	
Effect or Force Requirements to Enable Robotic Systems to Provide Assisted Exercise in People with Upper Limb Impairment	420
<i>A.E. Jackson, P.R. Culmer, M.C. Levesley, J.A. Cozens, S.G. Makower, B.B. Bhakta</i>	
Recognizing Hand Movements from a Singles EMG Sensor Using Guided Under-Determined Source Signal Separation	426
<i>L. A. Rivera, G. N. DeSouza</i>	
Analysis of Elbow-Joints Misalignment in Upper-Limb Exoskeleton	432
<i>M. Malosio, N. Pedrocchi, F. Vicentini, L.M. Tosatti</i>	
Jointless Structure and Under-Actuation Mechanism for Compact Hand Exoskeleton	438
<i>H.K. In, K.J. Cho, K.R. Kim, B.S. Lee</i>	
Influence of Planar Manipulandum to the Hand Trajectory During Point to Point Movement	444
<i>M.D. Kostic, D.B. Popovic, M.B. Popovic</i>	
Evaluation of the JACO roboticarm-clinico - Economic study for Powered Wheelchair users with Upper-extremity Disabilities	448
<i>V. Maheu, P.S. Archambault, J. Frappier, F. Routhier</i>	
Recognition of Grasp Types Through Principal Components of DWT Based EMG Features	453
<i>N.M. Kakoty, S.M. Hazarika</i>	
Effect of Progressive Visual Error Amplification on Human Motor Adaptation.....	459
<i>C. Sung, M.K. O'Malley</i>	
Effect of a Robotic Rehabilitation Device on Upper Limb Function in a Sub-Acute Cervical Spinal Cord Injury Population.....	465
<i>J. Zariffa, N. Kapadia, J.L.K. Kramer, P/ Taylor, M. Alizadeh-Meghriazi, V. Zivanovic, R. Willms, A. Townson, A. Curt, M.R. Popovic, J.D. Steeves</i>	
Modeling Upper Limb Clinical Scales by Robot-Measured Performance Parameters	470
<i>R. Colombo, I. Sterpi, A. Mazzone, F. Pisano, C. Delconte</i>	
An Explorative Study into Changes in Circle Drawing after Gravity Compensation Training in Chronic Stroke Patients	475
<i>G.B. Prange, T. Krabben, A.H.A. Stienen, H. van der Kooij, J.S. Rietman, J.H. Buurke</i>	
Biomechanical Assessment of Electric Lifting Chair for Persons with Disability	481
<i>J.-H. Bae, I. Moon</i>	
Detecting Falls by Analyzing Angular Momentum.....	486
<i>D. Marretti, V. Monaco, S. Micera</i>	
Computational Aspects of MN Activity Estimation-a Case Study with Post-Stroke Subjects	493
<i>M. Coscia, V. Monaco, M. Copogrosso, C. Chisari, S. Micera</i>	
Evaluation of Short Term Effects of the IROMEC Robotic Toy for Children with Developmental Disabilities	498
<i>T. Klein, G.J. Gelderblom, L. de Witte, S. Vanstipelen</i>	
Virtual Reality to Control Active Participation in a Subacute Stroke Patient during Robot-assisted Gait Training	503
<i>J. Bergmann, C. Krewer, F. Müller, A. Koenig, R. Riener</i>	
Classifying Human Manipulation Behavior	508
<i>I.M. Bullock, A.M. Dollar</i>	
Characterizing Head Motor Disorders to Create Novel Interfaces for People with Cerebral Palsy	514
<i>R. Raya, E. Rocon, R. Ceres, J. Harlaar, J. Geytenbeek</i>	
Pediatric Anklebot.....	520
<i>H.I. Krebs, S. Rossi, S.-J. Kim, P.K. Artemiadis, D. Williams, E. Casteli, P. Cappa</i>	
Development of a One-Body Optical Torque Sensor for Rehabilitation Robotic Systems	525
<i>G.M. Gu, P.H. Chang</i>	
Design and Control of a 3D Stroke Rehabilitation Platform	531
<i>Z. Cai, D. Tong, K. L. Meadmore, C. T. Freeman, A. M. Hughes, E. Rogers, J. H. Burridge</i>	

Telerehabilitation-Toward a Cost-Efficient Platform for Post-Stroke Neuro-rehabilitation	537
<i>J.C. Perry, J.A. Ruiz-Ruano, T. Keller</i>	
Velocity-Dependent Reference Trajectory Generation for the LOPES Gait Training Robot	543
<i>N. Tufekciler, E.H.F. van Asseldonk, H. van der Kooij</i>	
Effects of Added Inertia and Body Weight Support on Lateral Balance Control During Walking	548
<i>A. Pennycot, D. Wys, H. Vallery, R.Riener</i>	
River Multimodal Scenario for Rehabilitation Robotics	553
<i>M. Munih, D. Novak, M. Milavec, J. Ziherl, A. Olenšek, M. Mihelj</i>	
Motion Controlled Gait Enhancing Mobile Shoe for Rehabilitation	559
<i>I. Handzic, E.V. Vasudevan, K.B. Reed</i>	
A Decision-Theoretic Approach in the Design of an Adaptive Upper-Limb Stroke Rehabilitation Robot	565
<i>R. Huq, P. Kan, R. Goetschalckx, D. Hebert, J. Hoey, A. Mihailidis</i>	
Computer Vision-Based Classification of Hand Grip Variations in Neuro-rehabilitation	573
<i>J. Zariffa, J.D. Steeves</i>	
Robot-Aided Therapy on the Upper Limb of Subacute and Chronic Stroke Patients – a Biomechanical Approach	577
<i>S. Mazzoleni, M. Filippi, M.C. Carrozza, F. Posteraro, L. Puzzolante, E. Falchi</i>	
Development of an Evaluation Function for Eye-Hand Coordination Robotic Therapy	583
<i>N. Pernalet, F. Tang, S.M. Chang, F.Y. Cheng, P. Vetter, M. Stegemann, J. Grantner</i>	
Post-Stroke Wrist Rehabilitation Assisted with an Intention – Driven Functional Electrical Stimulation (FES) – Robot System	589
<i>X.L. Hu, K.Y. Tong, R. Li, M. Chen, J.J. Xue, S.K. Ho, P.N. Chen</i>	
Robotic Training and Clinical Assessment of Forearm and Wrist Movements after Incomplete Spinal Cord Injury-a Case Study	595
<i>N. Yozbatiran, J. Berliner, C. Boake, M.K. O'Malley, Z. Kadivar, G.E. Francisco</i>	
A Pilot Study of Robotic-Assisted Exercise for Hand Weakness after Stroke	599
<i>J. Stein, L. Bishop, G. Gillen, R. Helbok</i>	
Single Degree-of-Freedom Exoskeleton Mechanism Design for Finger Rehabilitation	603
<i>E.T. Wolbrecht, D.J. Reinkensmeyer, A. Perez-Gracia</i>	
Mechanical Design of a Distal Arm Exoskeleton for Stroke and Spinal Cord Injury Rehabilitation	609
<i>A.U. Pehlivan, O. Celik, M.K. O'Malley</i>	
Robotic Training and Kinematic Analysis of Arm and Hand After Incomplete Spinal Cord Injury – a Case Study	614
<i>Z. Kadivar, J.L. Sullivan, A.U. Pehlivan, M.K. O'Malley, N. Yozbatiran, G. Francisco, Z. Kadivar</i>	
Objective Measurement of Synergistic Movement Patterns of the Upper Extremity Following Stroke-an Explorative Study	620
<i>T. Krabben, G.B. Prange, B.I. Molier, J.S. Rietman, J.H. Buurke</i>	
A Comparison of Motor Adaptations to Robotically Facilitated Upper Extremity Task Practice Demonstrated by Children with	625
<i>Q. Qiu, S. Adamovich, S. Saleh, I. Lafond, A.S. Merians, G.G. Fluet</i>	
Ankle Control and Strength Training for Children with Cerebral Palsy Using the Rutgers Ankle CP – A Case Study	630
<i>D. Cioi, A. Kale, G. Burdea, J. Engsberg, W. Janes, S. Ross</i>	
Passive Velocity Field Control of a Forearm – Wrist Rehabilitation Robot	636
<i>A. Erdogan, A.C. Satıcı, V. Patoglu</i>	
Online Learning and Adaptation of Patient Support During ADL Training	644
<i>M. Guidali, P. Schlink, A. Duschau-Wicke, R. Riener</i>	
Challenges in Bio-cooperative Rehabilitation Robotics	650
<i>M. Mihelj, D. Novak, J. Ziherl, A. Olenšek, M. Munih</i>	
Design of a Robotic Device for Assessment and Rehabilitation of Hand Sensory Function	656
<i>O. Lamercy, A.J. Robles, Y. Kim, R. Gassert</i>	
A Concept of Needs – Oriented Design and Evaluation of Assistive Robots Based on ICF	662
<i>Y. Matsumoto, Y. Nishida, Y. Motomura, Y. Okawa</i>	
Kinematics Analysis of Sit-To-Stand Assistive Device for the Elderly and Disabled	668
<i>I. Kim, W. Cho, G. Yuk, H. Yang, B.R. Jo, B.H. Min</i>	
An Embedded Human Motion Capture System for an Assistive Walking Robot	673
<i>C. Zong, X. Clady, M. Chetouani</i>	
Feasibility Studies of Robot-Assisted Stroke Rehabilitation at Clinic and Home Settings Using RUPERT	679
<i>H. Zhang, H. Austin, S. Buchanan, R. Herman, J. Koeneman, J. He</i>	

A Neuro-musculoskeletal Model of the Human Lower Limb – Towards EMG-Driven Actuation of Multiple Joints in Powered Orthoses	685
<i>M. Sartori, m. Reggiani, D.G. Lloyd, E. Pagello</i>	
Model Predictive Control Based Gait Pattern Generation for Wearable Exoskeletons	691
<i>L. Wang, E.H.F. van Asseldonk, H. van der Kooij</i>	
The Effects of Robotic-Assisted Locomotor Training on Spasticity and Volitional Control.....	697
<i>M.M. Mirbagheri, L.L. Ness, C. Patel, K. Quiney, W.Z. Rymer</i>	
Exoskeletal Meal Assistance System (EMASII) for Progressive Muscle Dystrophy Patient.....	701
<i>A. Koenig, X. Omlin, D. Novak, R. Riener</i>	
A Lower-Limb Power-Assist Robot with Perception-Assist	707
<i>Y. Hayashi, K. Kiguchi</i>	
Effects of Ankle Stiffness on Gait Selection of Dynamic Bipedal Walking with Flat Feet.....	713
<i>Y. Huang, Q. Wang, B. Chen, L. Wang</i>	
Uncontrolled Manifold Analysis of Standing-Up Motion for Development of an Assistance System.....	719
<i>Q. An, H. Asama, C.E. Stepp, Y. Matsuoka</i>	
Rendering Potential Wearable Robot Designs with the LOPES Gait Trainer	724
<i>B. Kijpman, E.H.F. van Asseldonk, H. van der Kooij, W. van Dijk, R. Ronsse</i>	
Development of Closed-Fitting – Type Walking Assistance Device for Legs and Evaluation of Muscle Activity	730
<i>T. Ikehara, K. Nagamura, T. Ushida, E. Tanaka, S. Saegusa, S. Kojima, L. Yuge</i>	
Study on Possible Control Algorithms for Lower Limb Rehabilitation System.....	737
<i>M. Kordasz, K. Kuczkowski, P. Sauer</i>	
Patient Adaptive Control of End-Effect or Based Gait Rehabilitation Devices Using a Haptic Control Framework.....	743
<i>S. Hussein, J. Krtiger</i>	
Development of Gait Training System Powered by Pneumatic Actuator like Human Musculoskeletal System.....	749
<i>S.-I. Yamamoto, Y. Shibata, T. Miyoshi, S. Imai, T. Nobutomo</i>	
Using Robots to Help People Habituate to Visible Disabilities	753
<i>L.D. Riek, P. Robinson</i>	
A Review on Bio-Cooperative Control in Gait Rehabilitation	761
<i>Y. Hasegawa, S. Oura</i>	
Quantifying Lower Limb Joint Position Sense Using a Robotic Exoskeleton – a Pilot Study	767
<i>A. Domingo, E. Marriott, R.B. de Grave, T. Lam</i>	
Position and Torque Tracking – Series Elastic Actuation versus Model-Based – Controlled Hydraulic Actuation	773
<i>A. Otten, A. Schouten, A. Stienen, W. van Vuuren, A. Stienen, E. van Asseldonk, A. Schouten, H. van der Kooij, A. Schouten</i>	
Quantifying Learned Non-Use after Stroke Using Unilateral and Bilateral Steering Tasks.....	779
<i>M. Johnson, R. Paranjape, E. Strachota, G. Tchekkanov</i>	
Instrumented Sorting Block Box for Children, a Preliminary Experiment.....	786
<i>J. Klein, A. Chen, E. Burdet</i>	
The Basic Mechanics of Bipedal Walking Lead to Asymmetric Behavior.....	792
<i>R.D. Gregg, A. Degani, Y. Dhafer, K.M. Lynch</i>	
The ACT - 4D – a Novel Rehabilitation Robot for the Quantification of Upper Limb Motor Impairments Following Brain Injury.....	798
<i>A.H.A. Stienen, J.G. McPherson, A.C. Schouten, J.P.A. Dewald</i>	
Stochastic Estimation of Human Shoulder Impedance with Robots – An Experimental Design.....	804
<i>K. Park, P.H. Chang</i>	
Haptic Recreation of Elbow Spasticity.....	812
<i>H.S. Park, J. Kim, D.L. Damiano</i>	
Development of a VR-based Treadmill Control Interface for Gait Assessment of Patients with Parkinson’s Disease	818
<i>H.S. Park, J.W. Yoon, J. Kim, K. Iseki, M. Hallett</i>	
Wrist and Finger Torque Sensor for the Quantification of Upper Limb Motor Impairments Following Brain Injury	823
<i>A.H.A. Stienen, T.S. Moulton, L.C. Miller, J.P.A. Dewald</i>	
Asymmetric Passive Dynamic Walker	828
<i>C. Honeycutt, J. Sushko, K.B. Reed</i>	
Evaluation of Proprioceptive Sense of the Elbow Joint with RehabRoby.....	834
<i>F. Ozkul, D.E. Barkana, S.B. Demirbas, S. Inal</i>	

Changes on EMG Activation in Healthy Subjects and Incomplete SCI Patients Following a Robot-Assisted Locomotor Training	840
<i>S. Mazzoleni, E. Boldrini, C. Laschi, M.C. Carrozza, G. Stampacchia, B. Rossi</i>	
Design and Evaluation of Mina - A Robotic Orthosis for Paraplegics	846
<i>P.D. Neuhaus, J.H. Noorden, T.J. Craig, T. Torres, J. Kirschbaum, J.E. Pratt</i>	
Walking Assistance Apparatus Using a Spatial Parallel Link Mechanism and a Weight Bearing Lift	854
<i>E. Tanaka, T. Ikehara, Y. Sato, H. Yusa, T. Sakurai, S. Saegusa, K. Ito, L. Yuge</i>	
A Passive Exoskeleton with Artificial Tendons	861
<i>W. van Dijk, H. van der Kooij, E. Hekman</i>	
Spring Uses in Exoskeleton Actuation Design	867
<i>S. Wang, W. van Dijk, H. van der Kooij</i>	
Experimental Studies on the Human Gait Using a Tethered Pelvic Assist Device (T-PAD)	873
<i>V. Vashista, S.K. Mustafa, S.K. Agrawal</i>	
Tiny Hydraulics for Powered Orthotics.....	879
<i>W. Durfee, J. Xia, E. Hsiao-Weckler</i>	
Model-Based Estimation of Active Knee Stiffness	885
<i>S. Pfeifer, M. Hardegger, H. Vallery, R. List, M. Foresti, R. Riener, E. J. Perreault</i>	
Ground Adaptive Standing Controller for a Powered Transfemoral Prosthesis	891
<i>B.E. Lawson, H.A. Varol, M. Goldfarb</i>	
Performance Characteristics of Anthropomorphic Prosthetic Hands	897
<i>J.T. Belter, A.M. Dollar</i>	
Vibrotactile Sensory Substitution in Multi-Fingered Hand Prostheses-Evaluation Studies	904
<i>M. D'Alonzo, C. Cipriani, M.C. Carrozza</i>	
On the Mechanics of the Knee during the Stance Phase of the Gait	910
<i>K. Shamaei, A.M. Dollar</i>	
Multigrasp Myoelectric Control for a Transradial Prosthesis.....	917
<i>S.A. Dalley, H.A. Varol, M. Goldfarb</i>	
A Configuration Dependent Muscle Model for the Myoelectric Control of a Transfemoral Prosthesis	923
<i>C.D. Hoover, K.B. Fite</i>	
Control and Implementation of a Powered Lower Limb Orthosis to Aid Walking in Paraplegic Individuals.....	929
<i>H.A. Quintero, R.J. Farris, M. Goldfarb</i>	
Robotic Wheelchair Control Interface Based on Head rest Pressure Measurement	935
<i>J. Heitmann, C. Kohn, D. Stefanov</i>	
Building a Safe Care-Providing Robot.....	941
<i>L. Fotoohi, A. Graser</i>	
Task-Oriented Control of a 9-DoFWMRA System for Opening a Spring-Loaded Door Task.....	947
<i>E. Farelo, R. Alqasemi, R. Dubey</i>	
A Two-class Self-Paced BCI to Control a Robot in Four Directions	953
<i>R. Ron-Angevin, F. Velasco-Alvarez, S. Sancha-Ros, L. da Silva-Sauer</i>	
Neural Correlates of Motor Learning and Performance in a Virtual Ball Putting Task.....	959
<i>L. Pitto, V. Novakovic, A. Basteris, V. Sanguineti</i>	
Nonlinear and Nonstationary Framework for Feature Extraction and Classification of Motor Imagery.....	965
<i>D. Trad, T. Al-ani, E. Monacelli, S. Delaplace, M. Jemni</i>	
A Sensory Feedback System Utilizing Cutaneous Electrical Stimulation for Stroke Patients with Sensory Loss.....	971
<i>K. Kita, K. Takeda, R. Osu, J. Ushiba, S. Sakata, Y. Otaka</i>	
Limit-Push Training Reduces Motor Variability.....	977
<i>I. Sharp, J.L. Patton</i>	
Subject-Specific Lower Limb Waveforms Planning via Artificial Neural Network	983
<i>T.P. Luu, H.B. Lim, X. Qu, K.H. Hoon, K.H. Low</i>	
Adaptive Locomotor Training on an End-Effector.....	989
<i>C. Tomelleri, A. Waldner, C. Werner, S. Hesse</i>	
Effect of Added Inertia on the Pelvis on Gait.....	994
<i>J. Meuleman, W. Terpstra, E.H.F. van Asseldonk, H. van der Kooij</i>	
Conceptualization of an Exoskeleton Continuous Passive Motion (CPM) Device Using a Link Structure.....	1000
<i>K.J. Kim, M.S. Kang, Y.S. Choi, J. Han, C. Han</i>	
A Novel Biofeedback Cycling Training to Improve Gait Symmetry in Stroke Patients – a Case Series Study	1006
<i>E. Ambrosini, S. Ferrante, A. Pedrocchi, G. Ferrigno, E. Guanziroli, F. Molteni</i>	

Design of Human – Machine Interface and Altering of Pelvic Obliquity with RGR Trainer	1012
<i>M. Pietrusinski, O. Unluhisarcikli, I. Cajigas, P. Bonato</i>	
On Stability and Passivity of Haptic Devices Characterized by a Series Elastic Actuation and Considerable End-Point Mass	1018
<i>J. Oblak, Z. Matjacic</i>	
Psychophysiological Responses to Robot Training in Different Recovery Phases after Stroke	1023
<i>N. Goljar, M. Javh, J. Poje, J. Ocepek, D. Novak, J. Ziherl, A. Olensek, M. Mihelj, M. Munih</i>	
Design of a Minimally Constraining, Passively Supported Gait Training Exoskeleton - ALEXII	1029
<i>K.N. Winfree, P. Stegall, S.K. Agrawal</i>	
Integrating Proprioceptive Assessment with Proprioceptive Training of Stroke Patients	1035
<i>V. Squeri, J. Zenzeri, P. Morasso, A. Basteris</i>	
Time Independent Functional Task Training	1041
<i>E.B. Brokaw, T.M. Murray, T. Nef, P.S. Lum, E.B. Brokaw, D. Nichols, R.J. Holley</i>	
Upper Limb Stroke Rehabilitation – the Effectiveness of Stimulation Assistance through Iterative Learning (SAIL)	1047
<i>K.L. Meadmore, Z. Cai, D. Tong, A.-M. Hughes, C.T. Freeman, E. Rogers, J.H. Burridge</i>	
Cable-Based Parallel Manipulator for Rehabilitation of Shoulder and Elbow Movements.....	1053
<i>W.M. Nunes, L.A.O. Rodrigues, L. P. Oliveira, J. F. Ribeiro, J.C. M. Carvalho, R. S. Goncalves</i>	
Arm Control Recovery Enhanced by Error Augmentation	1059
<i>F. Abdollahi, S.V. Rozario, R.V. Kenyon, J. L. Patton, E. Case, M. Kovic, M. Listenberger</i>	
Shoulder Mechanism Design of an Exoskeleton Robot for Stroke Patient Rehabilitation	1065
<i>D. Koo, P.H. Chang, M. K. Sohn, J.-H. Shin</i>	
Wrist-RoboHab – A Robot for Treatment and Evaluation of Brain Injury Patients	1071
<i>M.A. Baniasad, F. Farahmand, N.N. Ansari</i>	
Facilitating Robot-Assisted Training in MS Patients with Arm Paresis	1076
<i>H. Bastiaens, G. Alders, P. Feys, L. Kerhofs, B. Truyens, R. Geers, A. Goedhart, S. Notelaers, K. Coninx</i>	
Symmetry Modes and Stiffnesses for Bimanual Rehabilitation.....	1082
<i>S. McAmis, K.B. Reed</i>	
A Tailored Exercise of Manipulation of Virtual Tools to Treat Upper Limb Impairment in Multiple Sclerosis	1088
<i>A. Basteris, A. De Luca, V. Sanguineti, C. Solaro, M. Mueller, I. Carpinella, D. Cattaneo, R. Bertoni, M. Ferrarin</i>	
Development of an Upper Limb Patient Simulator for Physical Therapy Exercise.....	1093
<i>Y. Takhashi, T. Komeda, H. Koyama, S.I. Yamamoto, T. Arimatsu, Y. Kawakami, K. Inoue, Y. A. Frisoli, E. Sotgiu, B. Rossi, C. Chisari</i>	
Design of the ROBIN System – Whole – Arm Multi-Model Sensorimotor Environment for the Rehabilitation of Brain Injuries while Sitting or Standing	1097
<i>R.C.V. Loureiro, T.A. Smith</i>	
Design and Implementation of a Training Strategy in Chronic Stroke with an Arm Robotic Exoskeleton	1103
<i>A. Frisoli, E. Sotgiu, B. Rossi, C. Chisari</i>	
Interlimb Coordination Evoked by Unilateral Mechanical Perturbation During Body-Weight Supported Gait.....	1111
<i>P.K. Artemiadis, H. I. Krebs</i>	
Evaluation of Negative Viscosity as Upper Extremity Training for Stroke Survivors	1116
<i>F.C. Huang, J.L. Patton</i>	
A Novel Mechatronic System for Measuring End-Point Stiffness-Mechanical Design and Preliminary Tests	1122
<i>L. Masia, G. Sandini, P.G. Morasso</i>	
The Relationship Between the Flexion Synergy and Stretch Reflexes in Individuals with Chronic Hemiparetic Stroke.....	1128
<i>J. G. McPherson, A.H.A. Stienen, J.M. Drogos, J. P.A. Dewald</i>	
Author Index	