Contents

Volume 1

Part I

Characterization and Modulation of Neurophysiological Signals

New Approaches for Targeted Neuromodulation of the Motor Nervous System (I)

Motor Outcomes of Repetitive Transcranial Magnetic Stimulation Are Dependent on the Specific Interneuron Circuit Targeted 
Ricci Hannah, Martin Sommer, Sean Cavanagh, Steven Jerjian and John C. Rothwell

3

Novel Non-invasive Brain Stimulation Techniques to Modify Brain Networks After Stroke
Ulf Ziemann

9

Effect of Feedback Type on the Effectiveness of a Novel Associative BCI Protocol Targeting the Tibialis Anterior Muscle
Natalie Mrachacz-Kersting

13

Static Magnetic Field Stimulation: An Ancient-Novel Member of the Non-invasive Brain Stimulation Techniques
Antonio Oliviero

19
Part II
Characterization and Modulation of Neurophysiological Signals

New Approaches for Targeted Neuromodulation of the Motor Nervous System (II)

A Computational Framework for the Design of Spinal Neuroprostheses ........................................... 23
Marco Capogrosso, Erwan Bezard, Jocelyne Bloch, Gregoire Courtine and Silvestro Micera

Operant Conditioning of the Tibialis Anterior Motor Evoked Potential to Transcranial Magnetic Stimulation ............ 29
Aiko K. Thompson, Rachel H. Cote and Christina R. Thompson

Cycling with Plantar Stimulation Increases Cutaneomuscular-Conditioned Spinal Excitability in Subjects with Incomplete Spinal Cord Injury ..................................................... 33
Stefano Piazza, Diego Serrano-Muñoz, Julio Gómez-Soriano, Diego Torricelli, Gerardo Avila-Martin, Iriana Galan-Arriero, José Luis Pons and Julian Taylor

Identifying Spinal Lesion Site from Surface EMG Grid Recordings ..................................................... 39
B. Afsharipour, M. Sandhu, G. Rasool, N.L. Suresh and W.Z. Rymer

New Tools for Old Problems: Magnetic Stimulation to Study (and Help) the Brain ........................................ 45
Casto Rivadulla, Jordi Aguilá-Macías, Sandra Prieto-Soler, Juan Aguilar and Javier Cudeiro

Part III
Characterization and Modulation of Neurophysiological Signals

Operant Conditioning of Spinal Reflexes: From Basic Science to Functional Changes in Health and Disease

Effects of H-Reflex Operant Conditioning in Humans ......................... 53
Aiko K. Thompson, Stephanie D. Pudlik and Christina R. Thompson

Operant Conditioning of the Human Soleus Short Latency Stretch Reflex and Implications for the Medium Latency Soleus Stretch Reflex ......................................................... 59
Natalie Mrachacz-Kersting and Uwe G. Kersting
Part IV

Characterization and Modulation of Neurophysiological Signals

Experimental Approaches to Restore Loss of Function

Human Adult Oligodendrocyte Precursor Cell Biology: The Bottleneck for Effective Pro-remyelinating Therapies for Multiple Sclerosis ......................................................... 67
Fernando de Castro

Modulation of Input-Output Balance by the Axon Initial Segment . . 69
Juan José Garrido

Using LFP Generators to Detect Abnormal Activity in Multiple Networks: A Tool to Explore Diaschisis ................................. 75
Óscar Herreras, Daniel Torres, Tania Ortuño and Julia Makarova

The Brain’s Camera. Optimal Algorithms for Wiring the Eye to the Brain Shape How We See .............................................. 81

How Do Interconnected Neuronal Networks Adjust to External Stimulation: Parametric Studies of DBS-FMRI ............................ 85
Javier Moya, Daniel Torres, David Moratal and Santiago Canals

Part V

Characterization and Modulation of Neurophysiological Signals

Sensory Restoration and Adaptive Neural Interfaces

Monitoring Parkinson’s Disease Rehabilitation from Phonation Biomechanics ................................................................. 93
P. Gómez-Vilda, P. Lirio, D. Palacios-Alonso, V. Rodellar-Biarge and N. Polo

Influence of Interactions Between Virtual Channels in Cochlear Implants: Biological Stimulation Using Current Source Method ..... 99
Ernesto A. Martínez–Rams, Vicente Garcerán–Hernández, Mikel Val, Eduardo Fernandez and José Manuel Ferrández

Epileptic Photosensitivity: Towards Implementation of Preventative Measures ................................................................. 103
Jaime Parra

Neuroplasticity and Blindness: From Clinical Setting to Technology Research ................................................................. 107
Arantxa Alfaro, Angela Bernabeu and Eduardo Fernández

Visual Prostheses—The Past and the Future .............................. 111
John B. Troy
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part VI</td>
<td></td>
</tr>
<tr>
<td>Characterization and Modulation of Neurophysiological Signals</td>
<td></td>
</tr>
<tr>
<td>Investigating Neural Control Strategies of Movement with EMG Signals</td>
<td></td>
</tr>
<tr>
<td>Introduction to EMG for the Study of Movement:</td>
<td>117</td>
</tr>
<tr>
<td>From Bipolar to High-Density</td>
<td></td>
</tr>
<tr>
<td>S.D.H. Soedirdjo, B. Afsharipour, P. Cattarello and R. Merletti</td>
<td></td>
</tr>
<tr>
<td>A Novel Measure of Motor Unit Action Potential Variability</td>
<td>123</td>
</tr>
<tr>
<td>in Nonstationary Surface Electromyograms</td>
<td></td>
</tr>
<tr>
<td>Vojko Glaser and Aleš Holobar</td>
<td></td>
</tr>
<tr>
<td>Neural Control of Muscles in Tremor Patients</td>
<td>129</td>
</tr>
<tr>
<td>Juan A. Gallego, Jakob L. Dideriksen, Ales Holobar, Eduardo Rocon,</td>
<td></td>
</tr>
<tr>
<td>José L. Pons and Dario Farina</td>
<td></td>
</tr>
<tr>
<td>Corticospinal Coherence During Frequency-Modulated Isometric Ankle</td>
<td>135</td>
</tr>
<tr>
<td>Dorsiflexion</td>
<td></td>
</tr>
<tr>
<td>A. Úbeda, A. Del Vecchio, M. Sartori, U.Ş. Yavuz, F. Negro,</td>
<td></td>
</tr>
<tr>
<td>F. Felici, J.M. Azorín and D. Farina</td>
<td></td>
</tr>
<tr>
<td>Stretch Reflexes in Shoulder Muscles Are Described Best</td>
<td>141</td>
</tr>
<tr>
<td>by Heteronymous Pathways</td>
<td></td>
</tr>
<tr>
<td>M. Hongchul Sohn, Emma M. Baillargeon, David B. Lipps and Eric J. Perreault</td>
<td></td>
</tr>
<tr>
<td>Identifying Motor Units in Longitudinal Studies with High-Density</td>
<td>147</td>
</tr>
<tr>
<td>Surface Electromyography</td>
<td></td>
</tr>
<tr>
<td>Eduardo Martinez-Valdes, Francesco Negro, Christopher M. Laine,</td>
<td></td>
</tr>
<tr>
<td>Deborah L. Falla, Frank Mayer and Dario Farina</td>
<td></td>
</tr>
<tr>
<td>Transfer Learning for Rapid Re-calibration of a Myoelectric Prosthesis</td>
<td>153</td>
</tr>
<tr>
<td>After Electrode Shift</td>
<td></td>
</tr>
<tr>
<td>Cosima Prahm, Benjamin Paassen, Alexander Schulz, Barbara Hammer and</td>
<td></td>
</tr>
<tr>
<td>Oskar Aszmann</td>
<td></td>
</tr>
<tr>
<td>EMG Discrete Classification Towards a Myoelectric Control of a Myoelectric Control of a Robotic Exoskeleton in Motor Rehabilitation</td>
<td>159</td>
</tr>
<tr>
<td>N. Irastorza-Landa, A. Sarasola-Sanz, F. Shiman, E. López-Larraz,</td>
<td></td>
</tr>
</tbody>
</table>
Part VII

Characterization and Modulation of Neurophysiological Signals

Investigation of the Human Neuromuscular System Using Human Reflexes: Past, Present and the Future

Difficulties Faced in Standardized Receptor Stimulation and in Standardized Analysis of Muscle Responses to a Stimulus ................................. 167
Kemal S. Türker

The Reflex Circuitry Originating from the Cutaneous Receptors of the Hand to the First Dorsal Interosseus Muscle .......................... 171
Kemal S. Türker and Mehmet C. Kahya

Reflex Circuitry Originating from the Muscle Spindles to the Tibialis Anterior Muscle ................................ 177
Utku S. Yavuz, Francesco Negro, Robin Diedrichs, Kemal S. Türker and Dario Farina

Jaw Reflexes Originating from the Periodontal and Muscle Spindle Receptors to the Jaw Muscles ............................. 183
G. Yılmaz, P. Uğünçius and K.S. Türker

Part VIII

Empowering and Quantifying Neurorehabilitation

Biomechanics and Movement Analysis in Rehabilitation (I)

Stance Sub-phases Gait Event Detection in Real-Time for Ramp Ascent and Descent ................................................................. 191
Hafiz F. Maqbool, Muhammad A.B. Husman, Mohammed I. Awad, Alireza Abouhossein, Nadeem Iqbal and Abbas A. Dehghani-Sanij

Is Clinical Gait Analysis Useful in Guiding Rehabilitation Therapy Decisions in Patients with Spinal Cord Damage? ..................... 197
Anna Murphy, Barry Rawicki, Stella Kravtsov and Peter New

Phonatory and Articulatory Correlates in Kinematic Neuromotor Degeneration ................................................................. 203

Analysis and Quantification of Upper-Limb Movement in Motor Rehabilitation After Stroke .................................................... 209
R. Mariana Silva, Emanuel Sousa, Pedro Fonseca, Ana Rita Pinheiro, Cláudia Silva, Miguel V. Correia and Sandra Mouta
Part IX

Empowering and Quantifying Neurorehabilitation

Biomechanics and Movement Analysis in Rehabilitation (II)

Effect of Motor-Cognitive (Dual Task) Rehabilitation Program on Gait Biomechanics in Parkinson’s Disease: Case Study .......................... 217
Constanza I. San Martín, José M. Tomás and Pilar Serra-Añó

Reliability of Functional Principal Components Decomposition of Ground Reaction Forces in Post-stroke Patients ......................... 223
María-José Vivas-Broseta and Juan-Manuel Belda-Lois

Interactive Locomotion of Mechanically Coupled Bipedal Agents: Modeling and Experiments ...................................................... 229
Jessica Lanini, Alexis Duburcq and Auke Ijspeert

Interference During Simultaneous Performance of a Motor and Cognitive Task Involving the Upper Extremity After Stroke ........................ 235

Part X

Empowering and Quantifying Neurorehabilitation

Advances in Understanding Human Movement and Motor Interactions (I)

Human Movement Execution Control Combined with Posture Control—A Neurorobotics Approach ................................................. 243
T. Mergner and V. Lippi

Efficacy of Cardiovascular Activity in Stroke Rehabilitation Therapy ......................................................... 249
Javier Rodríguez and Emel Demircan

Modelling Collaborative Strategies in Physical Human-Human Interaction .................................................................................... 253
Vinil Thekkedath Chackochan and Vittorio Sanguineti

Soft Robots that Mimic the Neuromusculoskeletal System ........................ 259
Manolo Garabini, Cosimo Della Santina, Matteo Bianchi, Manuel Catalano, Giorgio Grioli and Antonio Bicchi

Predictive Framework of Human Locomotion Based on Neuromuscular Primitives and Modeling .................................................. 265
Massimo Sartori, José González-Vargas, Strahinja Došen, José L. Pons and Dario Farina
Part XI

Empowering and Quantifying Neurorehabilitation

Advances in Understanding Human Movement and Motor Interactions (II)

Towards a Better Understanding of Stability in Human Walking Using Model-Based Optimal Control and Experimental Data ................. 273
Katja Mombaur, C. Javier Gonzalez and Martin L. Felis

Gait Abnormalities of Above Knee Amputees During Late Swing Phase, Is It a Design Deficiency or Compensatory Strategy? ............. 279

A Novel Controller for Bipedal Locomotion Integrating Feed-Forward and Feedback Mechanisms ........................................ 285
Xiaofeng Xiong, Massimo Sartori, Strahinja Dosen, José González-Vargas, Florentin Wörgötter and Dario Farina

A Preliminary Comparison of Stepping Responses Following Perturbations During Overground and Treadmill Walking ............. 291
Matjaž Zadravec, Andrej Olenšek and Zlatko Matjačić

Part XII

Empowering and Quantifying Neurorehabilitation

Clinical Needs and Prospects of Neurorehabilitation Technology in Stroke

Effectiveness of Interventions to Decrease the Physical and Mental Burden and Strain of Informal Caregivers of Stroke Patients: A Systematic Review ........................................ 299
E. Rubbens, L. De Clerck and E. Swinnen

Effect of Providing Ankle-Foot Orthoses in Patients with Acute and Subacute Stroke: A Randomized Controlled Trial ............. 305
Corien D.M. Nikamp, Jaap H. Buurke, Job van der Palen, Hermie J. Hermens and Johan S. Rietman

User Acceptance of a Balance Support System that Enables Unsupervised Training of Balance and Walking in Stroke Survivors ........................................... 311
J.A.M. Haarman, J. Reenalda, P. Lammertse, J.H. Buurke, H. van der Kooij and J.S. Rietman
Upper Extremity Training with CUREs Robot in Subacute Stroke: A Pilot Study. Wasuwat Kitisomprayoonkul, Pim Bhodhiassana and Viboon Sangveraphunsiri


Part XIII

Empowering and Quantifying Neurorehabilitation

Clinical Needs and Prospects of Neurorehabilitation Technology in SCI

Usability of the Combination of Brain-Computer Interface, Functional Electrical Stimulation and Virtual Reality for Improving Hand Function in Spinal Cord Injured Patients. Manuel Bayon-Calatayud, Fernando Trincado-Alonso, Eduardo López-Larraz, Luis Montesano, José Luis Pons and Ángel Gil-Agudo


Physiological Evaluation of Different Control Modes of Lower Limb Robotic Exoskeleton H2 in Patients with Incomplete Spinal Cord Injury. Soraya Pérez-Nombela, Antonio J. del-Ama, Guillermo Asín-Prieto, Elisa Piñuela-Martín, Vicente Lozano-Berrio, Diego Serrano-Muñoz, Ángel Gil-Agudo, José L. Pons and Juan C. Moreno

Muscle Activity and Coordination During Robot-Assisted Walking with H2 Exoskeleton. Antonio J. del-Ama, Guillermo Asín-Prieto, Elisa Piñuela-Martín, Soraya Pérez-Nombela, Vicente Lozano-Berrio, Diego Serrano-Muñoz, Fernando Trincado-Alonso, José González-Vargas, Ángel Gil-Agudo, José L. Pons and Juan C. Moreno

Modelling Neuromuscular Function of SCI Patients in Balancing. Hsien-Yung Huang, Ildar Farkhatdinov, Arash Arami and Etienne Burdet
Part XIV

Empowering and Quantifying Neurorehabilitation

Interpersonal Rehabilitation Games

Motivation and Exercise Intensity in Competition and Cooperation Between a Patient and Unimpaired Person in Arm Rehabilitation ........................................ 363
Maja Goršič, Imre Cikajlo and Domen Novak

Towards Pervasive Motor and Cognitive Rehabilitation Strategies Mediated by Social Interaction ................................. 369
Hoang H. Le, Martin J. Loomes and Rui C.V. Loureiro

Collaborative Gaming to Enhance Patient Performance During Virtual Therapy ............................................................. 375
Michael Mace, Paul Rinne, Nawal Kinany, Paul Bentley and Etienne Burdet

Flowing to the Optimal Challenge: An Adaptive Challenge Framework for Multiplayer Games ......................... 381
Jaime E. Duarte, Kilian Baur and Robert Riener

Part XV

Empowering and Quantifying Neurorehabilitation

Gaming and Rehabilitation

Assessing the Gaming Experience of an Applied Game for Rehabilitation of the Arm and Hand Function: A Feasibility Study ............................... 389
Anke I.R. Kottink, Gerdienke B. Prange-Lasonder, Johan S. Rietman and Jaap H. Buurke

Combining EEG and Serious Games for Attention Assessment of Children with Cerebral Palsy ...................... 395
F.J. Perales and E. Amengual

INTERPLAY—Advanced Console for the Playful Rehabilitation of Children with Neuromotor Disabilities .................... 401

ViTAS Gaming Suite: Virtual Therapy Against Stroke .............. 407
Diego Dall’Alba, Iris Dimbwadyo, Stefano Piazza, Enrico Magnabosco, Giovanni Menegozzo and Paolo Fiorini
Game-Based Assessment in Upper-Limb Post-stroke Telerehabilitation ................................. 413
Cristina Rodríguez-de-Pablo, Andrej Savić and Thierry Keller

NAO Robot as Rehabilitation Assistant in a Kinect Controlled System ................................. 419
I. Rodríguez, A. Aguado, O. Parra, E. Lazkano and B. Sierra

Hand Rehabilitation with Toys with Embedded Sensors ................. 425
N.A. Borghese, R. Mainetti, J. Essenziale, E. Cavalli, E.M. Mancon and G. Pajardi

Assessment of Exergames as Treatment and Prevention of Dysgraphia ................................. 431

Examining VR/Robotic Hand Retraining in an Acute Rehabilitation Unit: A Pilot Study ......................... 437
Alma Merians, Mathew Yarossi, Jigna Patel, Qinyin Qiu, Gerard Fluet, Eugene Tunik and Sergei Adamovich

Serious Game and Wearable Haptic Devices for Neuro Motor Rehabilitation of Children with Cerebral Palsy .................. 443
Ilaria Bortone, Daniele Leonardis, Massimiliano Solazzi, Caterina Procopio, Alessandra Crecchi, Lucia Briscese, Paolo Andre, Luca Bonfiglio and Antonio Frisoli

Part XVI

Empowering and Quantifying Neurorehabilitation

Experimental Approaches for Restoring Hand Function

Introduction of an EMG-Controlled Game to Facilitate Hand Rehabilitation After Stroke .................. 451
Mohammad Ghassemi, Rajiv Ranganathan, Alex Barry, K. Triandafilou and Derek Kamper

Learning Interference in Dynamic Manipulation with Redundant Degrees of Freedom ................................. 457
Qiushi Fu and Marco Santello

Pinching Performance of a Spinal Cord Injured Patient with Exo-Glove with Respect to the Tendon Route Design ................. 463
Hyunki In, Brian Byunghyun Kang and Kyu-Jin Cho
The SoftHand Pro: Translation from Robotic Hand to Prosthetic Prototype .............................................. 469
Sasha B. Godfrey, Matteo Bianchi, Kristin Zhao, Manuel Catalano, Ryan Breighner, Amanda Theuer, Karen Andrews, Giorgio Grioli, Marco Santello and Antonio Bicchi

Part XVII
Rehabilitation Robotics and Neuroprosthetics
Wearable Human-Robot Interfaces for Upper Limb Functional Recovering
Wearable Elbow Exoskeleton Actuated with Shape Memory Alloy .............................................................. 477
D. Copaci, A. Flores, F. Rueda, I. Alguacil, D. Blanco and L. Moreno

Intuitive Control of a Prosthetic Elbow ........................... 483
Manelle Merad, Étienne de Montalivet, Agnès Roby-Brami and Nathanaël Jarrassé

Interaction Force Estimation for Transparency Control on Wearable Robots Using a Kalman Filter ........................... 489
Thiago Boaventura, Lisa Hammer and Jonas Buchli

Validation of a Gravity Compensation Algorithm for a Shoulder-Elbow Exoskeleton for Neurological Rehabilitation ......................................................... 495
S. Crea, M. Cempini, M. Moisè, A. Baldoni, E. Trigili, D. Marconi, M. Cortese, F. Giovacchini, F. Posteraro and N. Vitiello

A Robot-Assisted Neuro-Rehabilitation System for Post-Stroke Patients’ Motor Skill Evaluation with ALEX Exoskeleton ............. 501
F. Stroppa, C. Loconsole, S. Marcheschi and A. Frisoli

Rhythmic Movements After a Stroke: A Different Motor Primitive Should Receive a Dedicated Training .............................. 507
Patricia Leconte and Renaud Ronsse

Multimodal Control Architecture for Assistive Robotics ........ 513
José M. Catalán, Jorge A. Díez, Arturo Bertomeu-Motos, Francisco J. Badesa and Nicolás Garcia-Aracil

Rationale of an Integrated Robotic Approach for Upper Limb Functional Rehabilitation .................................................... 519
G. Sgherri, G. Lamola, C. Fanciullacci, M. Barsotti, E. Sotgiu, D. Leonardis, C. Procopio, B. Rossi, A. Frisoli and C. Chisari
Novel Mixed Active Hand Exoskeleton and Assistive Arm Device for Intensive Rehabilitative Treatment for Stroke Patients .................................................. 525
Michele Barsotti, Edoardo Sotgiu, Daniele Leonardis, Giada Sgherri, Giuseppe Lamola, Chiara Fanciullacci, Caterina Procopio, Carmelo Chisari and Antonio Frisoli

Design of a Prono-Supination Mechanism for Activities of Daily Living ............................................ 531
Jorge A. Díez, Andrea Blanco, José M. Catalán, Francisco J. Badesa, José M. Sabater and Nicolas García-Aracil

Part XVIII
Rehabilitation Robotics and Neuroprosthetics
Soft Wearable Robotics: Potential for Neurorehabilitation
MAXX: Mobility Assisting teXtile eXoskeleton that Exploits Neural Control Synergies .............................. 539
Kai Schmidt and Robert Riener

Soft Printable Pneumatics for Wrist Rehabilitation ......................... 545
H.K. Yap, H.Y. Ng and C.H. Yeow

Use of an Actuated Glove to Facilitate Hand Rehabilitation After Stroke .................................................. 551
Ning Yuan, Kelly Thielbar, Li-Qun Zhang and Derek G. Kamper

Design and Preliminary Testing of a Soft Exosuit for Assisting Elbow Movements and Hand Grasping ......................... 557
M. Xiloyannis, L. Cappello, B. Khanh Dinh, C.W. Antuvan and L. Masia

Part XIX
Rehabilitation Robotics and Neuroprosthetics
Next Generation Bionics
The Quest for a Bionic Hand .................................................. 565
Silvestro Micera

Prosthetic Control by Lower Limb Amputees Using Implantable Myoelectric Sensors ............................. 571
Kristleifur Kristjansson, Jona S. Sigurdardottir, Atli Ö. Sverrisson, Stefan P. Sigurðurþorsson, Olafur Sverrisson, Arni Einarsson, Knut Lechler, Thorvaldur Ingvarsson and Magnus Oddsson
A *MyoKinetic* HMI for the Control of Hand Prostheses: 
**A Feasibility Study** ............................................. 575
Sergio Tarantino, Francesco Clemente, Diego Barone, 
Marco Controzzi and Christian Cipriani

User Centered Design and Usability of Bionic Devices. .............. 581
L.W. O’Sullivan, V. Power, A. de Eyto and J. Ortiz

**Part XX**

**Rehabilitation Robotics and Neuroprosthetics**

**Advances in Limb Prosthetics**

Does Sensory Feedback in Prosthetic Hands Provide 
**Functional Benefits in Daily Activities of Amputees?** .............. 589
M. Marković, L.F. Engels, M. Schweisfurth, S. Došen, D. Wüstefeld 
and D. Farina

Synergy-Based Myocontrol of a Two Degree of Freedom 
**Robotic Arm in Children with Dystonia** .......................... 595
Francesca Lunardini, Claudia Casellato, Terence D. Sanger 
and Alessandra Pedrocchi

**Dynamic Stimulation Patterns for Conveying Proprioceptive 
Information from Multi-DOF Prosthesis** ............................ 601
Milica Isaković, Matija Štrbac, Minja Belić, Goran Bijelić, 
Igor Popović, Milutin Radotić, Strahinja Došen, 
Dario Farina and Thierry Keller

Evoking Referred Sensations of Missing Digits by Electro-Tactile 
**Stimulation: Preliminary Tests** .................................... 607
Marco D’Alonzo, Ahmed I.K. Alsaqqa, Marco Controzzi 
and Christian Cipriani

**Investigation into Energy Efficiency and Regeneration** 
in an Electric Prosthetic Knee ........................................ 613
M.I. Awad, A. Abouhossein, B. Chong, A.A. Dehghani-Sanij, 
R. Richardson, D. Moser and S. Zahedi

**Part XXI**

**Rehabilitation Robotics and Neuroprosthetics**

**Neuromechanical Modeling for Wearable Assistive Technologies**

A Model of Human Non-stepping Postural Responses 
as the Basis for a Biomimetic Control Strategy 
**for Robot-Assisted Balance** ........................................ 621
Maarten Afschrift, Joris De Schutter, Ilse Jonkers and Friedl De Groote
Optimizing Wearable Assistive Devices with Neuromuscular Models and Optimal Control ................................................................. 627
Manish Sreenivasa, Matthew Millard, Paul Manns and Katja Mombaur

Combining a 3D Reflex Based Neuromuscular Model with a State Estimator Based on Central Pattern Generators ........... 633
T.J.H. Brug, F. Dzeladini, A.R. Wu and A.J. Ijspeert

Subject-Specificity via 3D Ultrasound and Personalized Musculoskeletal Modeling .............................................................. 639
Massimo Sartori, Jonas Rubenson, David G. Lloyd, Dario Farina and Fausto A. Panizzolo

An In Vitro Approach for Directly Observing Muscle-Tendon Dynamics with Parallel Elastic Mechanical Assistance. ........ 643
Gregory S. Sawicki and Benjamin D. Robertson

Toward Balance Recovery with Active Leg Prostheses Using Neuromuscular Model Control ...................................................... 649
Hartmut Geyer, Nitish Thatte and Helei Duan

Part XXII

Rehabilitation Robotics and Neuroprosthetics

Motor Neuroprosthetics

Clinical Trial Protocol for Analyzing the Effect of the Intensity of FES-Based Therapy on Post-stroke Foot Drop ....................... 655
Eukene Imatz-Ojanguren, Haritz Zabaleta, David Valencia-Blanco, Jovana Malešević, Milos Kostić and Thierry Keller

TMR Improves Performance of Compensatory Tracking Using Myoelectric Control ............................................................... 661
Meike A. Schweisfurth, Tashina Bentz, Strahinja Došen, Jennifer Ernst, Marko Marković, Gunther Felmerer, Oskar C. Aszmann and Dario Farina

Injectable Stimulators Based on Rectification of High Frequency Current Bursts: Power Efficiency of 2 mm Thick Prototypes ...... 667
Laura Becerra-Fajardo, Roser Garcia-Arnau and Antoni Ivorra

Quasi-Static Control of Whole-Arm Motions with FES ....................... 673
Eric M. Schearer, Derek N. Wolf and Robert F. Kirsch

Hybrid Robotic System for Reaching Rehabilitation After Stroke: Reporting an Usability Experimentation ......................... 679
F. Resquín, J. González-Vargas, J. Ibañez, I. Dimbwadyo, S. Alves, L. Torres, L. Carrasco, F. Brunetti and J.L. Pons
Part XXIII
Rehabilitation Robotics and Neuroprosthetics

FES and Wearable Robot Systems in Rehabilitation and Assistance of Locomotion

Dynamic Optimization of a Hybrid Gait Neuroprosthesis to Improve Efficiency and Walking Duration:
A Simulation Study ....................................................... 687
Nicholas A. Kirsch, Naji A. Alibeji, Mark Redfern and Nitin Sharma

Preliminary Experiments of an Adaptive Low-Dimensional Control for a Hybrid Neuroprosthesis ......................... 693
Naji A. Alibeji, Nicholas A. Kirsch and Nitin Sharma

The Potential of Inertial Sensors in Posture, Gait and Cycling

FES-Assistance ............................................................ 699
Christine Azevedo Coste, Benoît Sijobert, Christian Geny, Jérôme Froger and Charles Fattal

Online Monitoring of Muscle Activity During Walking for Bio-feedback and for Observing the Effects of Transcutaneous Electrical Stimulation ........................................ 705
Nathan D. Bunt, Juan C. Moreno, Philipp Müller, Thomas Seel and Thomas Schauer

Walking Assistance Through Impedance Control of a Lower-Limb Exoskeleton .................................................. 711
Weiguang Huo, Samer Mohammed and Yacine Amrmat

Part XXIV
Rehabilitation Robotics and Neuroprosthetics

Novel Technologies and Natural Sensory Feedback for Phantom Limb Pain Modulation and Therapy

Natural Sensory Feedback for Phantom Limb Pain Modulation and Therapy ......................................................... 719
Winnie Jensen

Evaluation of the Effect of Sensory Feedback on Phantom Limb Pain in Multi-center Clinical Trials ......................... 725
Ken Yoshida, James Malec, Caleb Comoglio, Kristine Mosier, Romulus Lontis, Knud Larsen, Xavier Navarro and Winnie Jensen

On Biocompatibility and Stability of Transversal Intrafascicular Multichannel Electrodes—TIME ........................................ 731
Thomas Stieglitz, Tim Boretius, Paul Čvančara, David Guiraud, Thomas Guiho, Victor Manuel Lopez-Alvarez and Xavier Navarro
On the Use of Intraneural Transversal Electrodes to Develop Bidirectional Bionic Limbs ................................................................. 737
Silvestro Micera, Stanisa Raspopovic, Francesco Petrini, Jacopo Carpaneto, Calogero Oddo, Jordi Badia, Thomas Stieglitz, Xavier Navarro, Paolo M. Rossini and Giuseppe Granata

Advanced 56 Channels Stimulation System to Drive Intrafascicular Electrodes ................................................................. 743

Volume 2

Part XXV

Biological Signal Analysis

Neural Signal Processing of the Pathological Brain

Analysis of Functional Connectivity During an Auditory Oddball Task in Schizophrenia ................................................................. 751
P. Núñez, J. Poza, A. Bachiller, J. Gomez-Pilar, C. Gómez, A. Lubeiro, V. Molina and R. Hornero

Event-Related Phase-Amplitude Coupling: A Comparative Study ... 757
A. Bachiller, J. Gomez-Pilar, J. Poza, P. Núñez, C. Gómez, A. Lubeiro, V. Molina and R. Hornero

Assessment of Effective Connectivity in Alzheimer’s Disease Using Granger Causality ................................................................. 763
Celia Juan-Cruz, Carlos Gómez, Jesús Poza, Alberto Fernández and Roberto Hornero

Visual Detection of High Frequency Oscillations in MEG ............... 769
Carolina Migliorelli, Joan F. Alonso, Sergio Romero, Miguel A. Mañanas, Rafal Nowak and Antonio Russi

On Recalibration Strategies for Brain-Computer Interfaces Based on the Detection of Motor Intentions ........................................... 775
J. Ibáñez, E. López-Larraz, E. Monge, F. Molina-Rueda, L. Montesano and J.L. Pons
Part XXVI

Biological Signal Analysis

Data Mining and Physiological Signal

A Stress Classification System Based on Arousal Analysis of the Nervous System ......................................................... 783
R. Martínez, J. Abascal, A. Arruti, E. Irigoyen, J.I. Martín and J. Muguerza

Spectral Regression Kernel Discriminant Analysis for P300 Speller Based Brain-Computer Interfaces .................. 789
Víctor Martínez-Cagigal, Pablo Núñez and Roberto Hornero

Supervised + Unsupervised Classification for Human Pose Estimation with RGB-D Images: A First Step Towards a Rehabilitation System ................................................. 795
A. Aguado, I. Rodríguez, E. Lazkano and B. Sierra

Switch Mode to Control a Wheelchair Through EEG Signals .......... 801
F. Velasco-Álvarez, A. Fernández-Rodríguez and R. Ron-Angevin

The Biosignal C.A.O.S.: Reflections on the Usability of Physiological Sensing for Human-Computer Interaction Practitioners and Researchers ........................................ 807
Hugo Plácido da Silva

Part XXVII

Biological Signal Analysis

Human Gait Simulation for Exoskeleton Design and Patient Adaptation

Evaluation of Motion/Force Transmission Between Passive/Active Orthosis and Subject Through Forward Dynamic Analysis .... 815
Francisco Mouzo, Urbano Lugris, Javier Cuadrado, Josep M. Font-Llagunes and Francisco J. Alonso

Model-Based Optimization for the Design of Exoskeletons that Help Humans to Sustain Large Pushes While Walking ...... 821
R. Malin Schemschat, Debora Clever, Matthew Millard and Katja Mombaur

Neuromusculoskeletal Models of Human-Machine Interaction in Individuals Wearing Lower Limb Assistive Technologies .... 827
Massimo Sartori, Guillaume Durandau and Dario Farina

Design, Analysis and Simulation of a Novel Device for Locomotion Support .......................................................... 833
Rita Cardoso and Miguel T. Silva
Part XXVIII

Biological Signal Analysis

BCI Driven Approaches for Motor-Cognitive Rehabilitation After Stroke

An Associative Brain-Computer-Interface for Acute Stroke Patients 841

Brain Computer Interfaces for Cognitive Rehabilitation After Stroke 847
Andrea Kübler, Sonja Kleih and Donatella Mattia

Part XXIX

Biological Signal Analysis

Indirect Measures of Brain Activity: A Window into the Mind

Short-Term Effects of Real-Time Auditory Display (Sonification) on Gait Parameters in People with Parkinson’s Disease—A Pilot Study 855
Anna-Maria Gorgas, Lena Schön, Ronald Dlapka, Jakob Doppler, Michael Iber, Christian Gradl, Anita Kiselka, Tariq Siragy and Brian Horsak

Articulation Characterization in AD Speech Production 861
P. Gómez-Vilda, M.K. López de Ipiña, V. Rodellar-Biarge, D. Palacios-Alonso and M. Ecay-Torres

Non-invasive Biosignal Analysis Oriented to Early Diagnosis and Monitoring of Cognitive Impairments 867
K. López-de-Ipiña, J. Solé-Casals, U. Martínez de Lizarduy, P.M. Calvo, J. Iradi, M. Faundez-Zanuy and A. Bergareche

Eye-Tracking Data in Visual Search Tasks: A Hallmark of Cognitive Function 873
Vicente Pallarés, Mar Hernández and Laura Dempere-Marco

Part XXX

Biological Signal Analysis

Feedback Systems for Rehabilitation and Assistance

An Auditory Feedback System in Use with People Aged +50 Years: Compliance and Modifications in Gait Pattern 881
Theresa Fischer, Anita Kiselka, Ronald Dlapka, Jakob Doppler, Michael Iber, Christian Gradl, Anna-Maria Gorgas, Tariq Siragy and Brian Horsak
Supplementary Haptic Framework for Dexterous Rehabilitation................. 887
Alexandra Moringen and Helge Ritter

Cortical and Muscle Response to Focal Vibro-Tactile Stimuli.................. 893
Tijana Jevtic, Aleksandar Zivanovic and Rui C.V. Loureiro

Part XXXI

Biological Signal Analysis

Role of Input Synergies for Rehabilitation

The Role of Inputs Combination to Enhance the Internal Model and Body Control Ability................................................................. 901
Fady Alnajjar, Fatimah Harib, Shaima AlAmeri, Asma Almarzoqi,
Matti Itkonen, Hiroshi Yamasaki, Nazar Zaki and Shingo Shimoda

Feeling of Bodily Congruence to Visual Stimuli Improves Motor Imagery Based Brain-Computer Interface Control......................... 907
Junichi Ushiba, Shotaro Miyashita, Takashi Ono, Koji Aono,
Mitsuhiko Kodama and Yoshihisa Masakado

The Repertoire of Brain Synchronized States Accounts for Stroke Recovery................................................................. 913
Keiichi Kitajo, Yutaka Uno, Noriaki Hattori, Teiji Kawano,
Yuka O. Okazaki, Megumi Hatakenaka and Ichiro Miyai

Is Modular Control of Cycling Affected by Learning? Preliminary Results Using Muscle Biofeedback............................................................. 919
Diego Torricelli, Daniel Nemati Tobaruela, Cristiano De Marchis,
Filipe Barroso and José L. Pons

Part XXXII

Biological Signal Analysis

Modular Control in Healthy and Pathologic Subjects

Posture Dependent Spatiotemporal Modulation of Dynamic Torques During Sit-to-Stand Movements.................................................. 927
Hiroshi Yamasaki and Shingo Shimoda

Different Temporal Structure of Muscle Synergy Between Sit-to-Walk and Sit-to-Stand Motions in Human Standing Leg................. 933
Qi An, Hiroshi Yamakawa, Atsushi Yamashita and Hajime Asama

Changes in Muscle Synergy Organization After Neurological Lesions................................................................. 939
Denise J. Berger, F. Ferrari, A. Esposito, M. Masciullo, M. Molinari,
F. Lacquaniti and Andrea d’Avella
Motor Unit Coherence at Low Frequencies Increases Together with Cortical Excitability Following a Brain-Computer Interface Intervention in Acute Stroke Patients .................................................. 1001
Margherita Castronovo, N. Mrachacz-Kersting, F. Landi, HR. Jørgensen, K. Severinsen and D. Farina

Response of Spinal Excitability to Different Short-Lasting Motor Tasks: Preliminary Results ................................................................. 1007
Antonio Madrid, Verónica Robles-García, Yoanna Corral-Bergantiños, Josep Valls-Solé, Antonio Oliviero, Javier Cudeiro and Pablo Arias

Effect of Electrode Size on Amplitude Estimation of HDsEMG Maps ........................................................................................................ 1013
P. Cattarello, S.D.H. Soedirdjo, B. Afsharipour and R. Merletti

Processing of Motor Performance Related Reward After Stroke ........ 1019
Mario Widmer, Andreas R. Luft and Kai Lutz

Muscle Activation Variability Is Inversely Correlated with Walking Speed .................................................................................................. 1025
F. Dzeladini, A. Grappe, C. Simpson, A.R. Wu and A. Ijspeert

Spatial Facilitation of Reciprocal Inhibition and Crossed Inhibitory Responses to Soleus Motoneurons During Walking .................. 1031
Andrew J.T. Stevenson, Svend S. Geertsen, Jens B. Nielsen and Natalie Mrachacz-Kersting

Probabilistic Locomotion Mode Recognition with Wearable Sensors ........................................................................................................... 1037
Uriel Martinez-Hernandez, Imran Mahmood and Abbas A. Dehghani-Sanj

Simulation of Rehabilitation Therapies for Brachial Plexus Injury Under the Influence of External Actuators ........................................ 1043
Luis J. Monge Chamorro, Cecilia E. García Cena, Marie André Destarac and Roque Saltarén Pazmiño

Effects of Balance Training with Resistance Function on Center of Mass Trajectory and Muscle Co-contraction ................................. 1049
Leila Alizadeh Saravi, Sung-Jae Lee and Dohyung Lim

Relation Between Functional Movement and Kinematics in Robot Assisted Reach Exercise for Chronic Stroke Survivors .................. 1055
Ki Hun Cho and Won-Kyung Song

Motor Control Training Enhances Reactive Driving in Stroke—A Pilot Study ............................................................................................. 1061
Neha Lodha, Agostina Casamento-Moran and Evangelos A. Christou
Contents

BiMU—Inertial Sensors and Virtual Reality Games for the Rehabilitation of the Upper Limb in Cerebral Palsy .......... 1067
M.A. Velasco, B. Valle, R. Raya, A. Clemotte, R. Ceres,
M.G. Bueno and E. Rocon

Targeted Dance Program for Improved Mobility in Multiple Sclerosis ........................................ 1073
A.M. Scheidler, A.L. Tisha, D.L. Kinnett-Hopkins, Y.C. Learmonth,
R. Motl and C. López-Ortiz

Upper-Limb Motion Analysis in Daily Activities Using Wireless Inertial Sensors .................................... 1079
A. Bertomeu-Motos, I. Delegido, S. Ezquerro, L.D. Lledó,
J.M. Catalan and N. Garcia-Aracil

Reflex Response Modelling of Exoskeleton-User Interaction ........ 1085
Bas J. de Kruif, Emilio Schmidhauser, Konrad S. Stadler
and Leonard O’Sullivan

Adaptation of Stepping Responses During Perturbed Walking in Neurologically Impaired Subject .................... 1091
Andrej Olenšek, Matjaž Zadravec, Nika Goljar and Zlatko Matjačić

Delivering Remote Rehabilitation at Home: An Integrated Physio-Neuro Approach to Effective and User Friendly Wearable Devices .......................................................... 1097
Subhasis Banerji, John Heng, Alakananda Banerjee, P.S. Ponvignesh,
Daphne Menezes and Robins Kumar

Pseudo-Online Detection of Intention of Pedaling Start Cycle Through EEG Signals ................................. 1103
M. Rodríguez-Ugarte, Á. Costa, E. Iáñez, A. Úbeda and J.M. Azorín

How Many EEG Channels Are Optimal for a Motor Imagery Based BCI for Stroke Rehabilitation? .................. 1109
Ren Xu, Brendan Z. Allison, Rupert Ortner, Danut C. Irimia,
Amau Espinosa, Alexander Lechner and Christoph Guger

Denis Delisle-Rodriguez, Ana Cecilia Villa-Parra, Alberto López-Delis,
Anselmo Frizera-Neto, Eduardo Rocon and Teodiano Freire-Bastos

Spectral Entropy and Vector Machines Support for Imagined Motion Detection in Brain-Computer Interfaces .......... 1121
Fabio R. Llorella, Gustavo Patow and José M. Azorín
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>An EEG-Based Brain-Machine Interface to Control a 7-Degrees of Freedom Exoskeleton for Stroke Rehabilitation</td>
<td>1127</td>
</tr>
<tr>
<td>Preliminary EEG Characterisation of Intention to Stand and Walk for Exoskeleton Applications</td>
<td>1133</td>
</tr>
<tr>
<td>Alex Zervudachi, Eric Sanchez and Tom Carlson</td>
<td></td>
</tr>
<tr>
<td>Task Influence on Motor-Related Cortical Signals: Comparison Between Upper and Lower Limb Coordinated and Analytic Movements</td>
<td>1139</td>
</tr>
<tr>
<td>A. Martínez-Expósito, J. Ibáñez, F. Resquín and J.L. Pons</td>
<td></td>
</tr>
<tr>
<td>An Empirical Study of Factorization Methods to Quantify Motor Synergies</td>
<td>1145</td>
</tr>
<tr>
<td>Navid Lambert-Shirzad and H.F. Machiel Van der Loos</td>
<td></td>
</tr>
<tr>
<td>Decoding Muscle Excitation Primitives from Slow Cortical Potentials During Knee Flexion-Extension</td>
<td>1151</td>
</tr>
<tr>
<td>Recommendations for Games to Increase Patient Motivation During Upper Limb Amputee Rehabilitation</td>
<td>1157</td>
</tr>
<tr>
<td>Cosima Prahm, Fares Kayali, Agnes Sturma and Oskar Aszmann</td>
<td></td>
</tr>
<tr>
<td>Rehabilitation Robot in Primary Walking Pattern Training for SCI Patient at Home</td>
<td>1163</td>
</tr>
<tr>
<td>Taisuke Sakaki, Toshihiko Shimokawa, Nobuhiro Ushimi, Koji Murakami, Yong-Kwun Lee, Kazuhiro Tsuruta, Kanta Aoki, Kaoru Fujiiie, Ryuji Katamoto and Atsushi Sugyo</td>
<td></td>
</tr>
<tr>
<td>A Comprehensive Training Mode for Robot-Mediated Upper Limb Rehabilitation</td>
<td>1169</td>
</tr>
<tr>
<td>Aitziber Mancisidor, Asier Zubizarreta, Itziar Cabanes, Pablo Bengoa and Je Hyung Jung</td>
<td></td>
</tr>
<tr>
<td>Learning Motor Coordination Under Resistive Viscous Force Fields at the Joint Level with an Upper-Limb Robotic Exoskeleton</td>
<td>1175</td>
</tr>
<tr>
<td>Tommaso Proietti, Agnès Roby-Brami and Nathanaël Jarrassé</td>
<td></td>
</tr>
<tr>
<td>Improving Upper Extremity Impairments with Tongue Driven Robotic Assisted Rehabilitation: A Pilot Study</td>
<td>1181</td>
</tr>
<tr>
<td>S.N. Housley, D. Wu, S. Belagaje, M. Ghovanloo and A.J. Butler</td>
<td></td>
</tr>
</tbody>
</table>
Upper Limb Robot Assisted Rehabilitation Platform Combining Virtual Reality, Posture Estimation and Kinematic Indices............. 1187
D. Scorza, A. de Los Reyes, C. Cortés, A. Ardanza, A. Bertelsen, O.E. Ruiz, A. Gil and J. Flórez

User Requirements in Multimodal System Design and Robotics..... 1193
Jean Daly Lynn, Elaine Armstrong and Suzanne Martin

A Novel Exoskeleton for Continuous Monitoring of the Upper-Limb During Gross Motor Rehabilitation............................... 1199
Eduardo Piña-Martínez, Ricardo Roberts, Ernesto Rodriguez-Leal, Jose H. Flores-Arredondo and Rogelio Soto

Psychophysiological Measurements in a Robotic Platform for Upper Limbs Rehabilitation: First Trials.......................... 1205

The CP Walker for Strength Training in Children with Spastic Cerebral Palsy: A Training Program Proposal.................... 1211
Teresa Martín Lorenzo, Sergio Lerma Lara, Cristina Bayón, Oscar Ramírez and Eduardo Rocon

A Preliminary Test of a Portable Prototype System of FES Foot Drop Correction and Gait Measurements with a Hemiplegic Subject....................................................... 1217
Takashi Watanabe, Shun Endo, Ryusei Morita, Katsunori Murakami and Naomi Kuge

A Novel Robotic Walker for Over-Ground Gait Rehabilitation..... 1223
Jing Ye, Francisco A. Reyes and Haoyong Yu

Energy Consumption and Cardiorespiratory Load During Lokomat Walking Compared to Walking Without Robot-Assistance in Stroke Patients: Preliminary Results........ 1229
Nina Lefeber, Eva Swinnen, Marc Michielsen, Stieven Henderix and Eric Kerckhofs

Experiences in Four Years of HAL Exoskeleton SCI Rehabilitation................................................................. 1235
D. Grasmücke, O. Cruciger, R.Ch. Meindl, Th.A. Schildhauer and M. Aach

Control of a Robot Using Brain Computer Interface to Aid in Rehabilitation.......................................................... 1239
Pramod Chembrammel and Thenkurussi Kesavadas
Preliminary Evaluation of a Wearable Soft-Robotic Glove Supporting Grip Strength in ADL .................................................. 1245
B. Radder, G.B. Prange-Lasonder, A.I.R. Kottink, L. Gaasbeek,
K. Sletta, J. Holmberg, T. Meyer, J.H. Buurke and J.S. Rietman

User Acceptance of a Therapeutic System that Enables Hand Training Exercises in a Motivating Environment .............. 1251
B. Radder, G.B. Prange-Lasonder, A.I.R. Kottink, L. Gaasbeek,
J. Holmberg, A. Melendez-Calderon, J.H. Buurke and J.S. Rietman

Combining Soft Robotics and Brain-Machine Interfaces for Stroke Rehabilitation .................................................. 1257
Patricia A. Vargas, Fabricio Lima Brasil, Alistair C. McConnell,
Marta Vallejo, David W. Corne, Adam A. Stokes
and Renan Cipriano Moioli

Simulation of the Length Change in Muscles During the Arm Rotation for the Upper Brachial Plexus Injury .............. 1263
Marie André Destarac, Cecilia E. García Cena and Roque Saltarén Pazmiño

Analysis of Optimal Control Problem Formulations in Skeletal Movement Predictions ........................................ 1269
Gil Serrancolí, Joris De Schutter and Friedl De Groote

From Spiking Motor Units to Joint Function .................... 1275
Massimo Sartori, Utku S. Yavuz, Cornelius Frömmel and Dario Farina

Towards Behavioral Based Sensorimotor Controller Design for Wearable Soft Exoskeletal Applications .................. 1281
Imran Mahmood, Uriel Martinez-Hernandez and Abbas A. Dehghani-Sanij

Hybrid Robotic System Simulation for the Exploration of Novel Control Strategies .............................................. 1287
H. Barbouch, F. Resquin, J. González-Vargas, N. Khraief-Hadded,
S. Belghith and J.L. Pons

First Results on the Joint Use of E2Rebot and Gradior to Improve Cognitive Abilities ................................. 1293
J. Pérez-Turiel, M. Franco-Martin, J.C. Fraile, E. Parra and P. Viñas

Microsoft Kinect-Based System for Automatic Evaluation of the Modified Jebsen Test of Hand Function ............ 1299
Daniel Simonsen, Erika G. Spaich and Ole K. Andersen

Chair Kinematics, A Novel Criteria for Frailty Status Classification .................................................. 1305
N. Millor, M. Gómez, P. Lecumberri, A. Martínez-Ramírez,
J. Martiricorena and M. Izquierdo
Bioinspired Controller Based on a Phase Oscillator

Thomas G. Sugar and Sangram Redkar

An Active Compliant Knee Joint for Gait Assistance:
Design and Characterization

Matteo Fantozzi, Andrea Parri, Francesco Giovacchini, Tingfang Yan, Silvia Manca, Mario Cortese and Nicola Vitiello

Compliant Lightweight Actuator Designs for Robotic Assistance and Rehabilitation Exoskeletons

Dirk Lefeber, Marta Moltedo, Tomislav Bacek, Kevin Langlois, Karen Junius and Bram Vanderborght

Dynamic Balance Assessment During Pathological Bipedal Walking

Zlatko Matjačić, Matjaž Zadravec, Nika Goljar and Andrej Olenšek

Individualization of Gait Therapy Through Patient-Tailored Trajectory Generation

Santiago Focke Martinez, Olena Kuzmicheva, Danijela Ristić-Durrant and Axel Graeser

The Role of Corticomuscular Transmission in Movement Execution

Andrés Úbeda

Muscle Synergies: A Compact Way to Describe and Restore Neuromuscular Coordination

Diego Torricelli and José Luis Pons

Electrical Modulation of Cerebral Cortex Activity: Mechanisms and Applications


Part XXXVI

AITADIS Workshops

Pseudo-online Multimodal Interface Based on Movement Prediction for Lower Limbs Rehabilitation

T. Botelho, D. Soprani, C. Carvalho, P. Rodrigues, P. Schneider, A. Frizera-Neto and A. Ferreira

Experiences in Development and Application of Simplified Technologies for Rehabilitation and Gait Analysis

Fernando Salvucci, Ricardo Garbayo, Carolina Fernández Bizcay and Rafael Kohanoff
Quasi-static Tests on a Low Cost Polymer Optical Fiber Curvature Sensor ..................................... 1427
Arnaldo G. Leal Junior, Lucas G. Webster, Anselmo Frizera Neto and Maria José Pontes

Comprehensive Environmental Intervention for Cerebral Palsy Based on the International Classification of Functioning, Disability and Health ............................................. 1433
P. Barria, V. Schiariti, A. Andrade, A. Bandera, H. Henriquez and A. Moris

Proposal for Clinical Validation of Lower Limb Robotic Exoskeleton in Patients with Incomplete Spinal Cord Injury ........ 1439
Soraya Pérez-Nombela, Antonio J. del-Ama, Ángel Gil-Agudo, Mónica Alcobendas-Maestro, Fernando López-Díaz, Jesús Benito-Penalva, José L. Pons and Juan C. Moreno

Serious Game for Post-stroke Upper Limb Rehabilitation .......... 1445
Nicolás Valencia, Vivianne Cardoso, Anselmo Frizera and Teodiano Freire-Bastos

Wearable Robotic Walker for Gait Rehabilitation and Assistance in Patients with Cerebral Palsy ...................... 1451
Carlos A. Cifuentes, Cristina Bayon, Sergio Lerma, Anselmo Frizera, Luis Rodriguez and Eduardo Rocon

Effects of the Use of Functional Electro-Stimulation (FES) on the Physiological Cost, Speed and Capacity of Gait After Stroke ................................................................. 1457
S. Mercante, E. Cersósimo, C. Letelier and S. Cacciavillani

Evaluating Cognitive Mechanisms During Walking from EEG Signals ....................................................... 1463
E. Iáñez, Á. Costa, A. Úbeda, E. Hortal, M. Rodríguez-Ugarte and J.M. Azorín

Denis Delisle-Rodriguez, Ana Cecilia Villa-Parra, Alberto López-Delis, Anselmo Frizera-Neto, Eduardo Rocon and Teodiano Freire-Bastos

Defining Therapeutic Scenarios Using Robots for Children with Cerebral Palsy ........................................ 1475
Jaime A. Buitrago and Eduardo F. Caicedo Bravo

An Approach to a Phase Model for Steady State Visually Evoked Potentials .................................................. 1481
Jaiber Cardona, Eduardo Caicedo, Wilfredo Alfonso, Ricardo Chavarriaga and José del R. Millán
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velocity Dependant Spasticity Detection for Active Exoskeleton Based Therapies</td>
<td>1491</td>
</tr>
<tr>
<td>R. Mendoza-Crespo, R. Soto and J.L. Pons</td>
<td></td>
</tr>
<tr>
<td>Bioinspired Hip Exoskeleton for Enhanced Physical Interaction</td>
<td>1497</td>
</tr>
<tr>
<td>Diego Casas, Marcela Gonzalez Rubio, Miguel Montoya, Wilson Sierra, Luis Rodriguez, Eduardo Rocon and Carlos A. Cifuentes</td>
<td></td>
</tr>
<tr>
<td>Inclusive Approach for Developing a Robotic Vehicle for Disabled Children</td>
<td>1503</td>
</tr>
<tr>
<td>H. Fernández, G. Mercado, V. González and F. Bunetti</td>
<td></td>
</tr>
<tr>
<td>Erratum to: Stance Sub-phases Gait Event Detection in Real-Time for Ramp Ascent and Descent</td>
<td>E1</td>
</tr>
<tr>
<td>Hafiz F. Maqbool, Muhammad A.B. Husman, Mohammed I. Awad, Alireza Abouhossein, Nadeem Iqbal and Abbas A. Dehghani-Sanj</td>
<td></td>
</tr>
</tbody>
</table>
Converging Clinical and Engineering Research on Neurorehabilitation II
Proceedings of the 3rd International Conference on NeuroRehabilitation (ICNR2016), October 18-21, 2016, Segovia, Spain
Ibáñez, J.; González-Vargas, J.; Azorín, J.M.; Akay, M.; Pons, J.L. (Eds.)
2017, XXXIII, 1507 p. 427 illus., 355 illus. in color. In 2 volumes, not available separately., Hardcover
ISBN: 978-3-319-46668-2