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Poster Sessions — ICORR 2013

Poster Session A

Monday, June 24, 2013

A1

Optimization of Human Walking % for Exoskeletal Support

Wietse van Dijk¹ and Herman van der Kooij²

¹Delft University of Technology, ²University of Twente

A2

Adaptive Control of a Serial-in-Parallel Robotic Rehabilitation Device %

Ali Utku Pehlivan, Fabrizio Sergi, Marcia K. O'Malley

Rice University

A3

Comparison of the Passive Dynamics of Walking on Ground, Tied-belt and Split-belt Treadmills, and via the Gait Enhancing Mobile Shoe (GEMS) %

Ismet Handzic and Kyle Reed

University of South Florida

A4

The Biomechanics and Energetics of Human Running Using an Elastic Knee Exoskeleton %

Grant Elliott¹, Gregory Sawicki², Andrew Marecki¹, Hugh Herr¹

¹Massachusetts Institute of Technology, ²North Carolina State University

A5

A Soft Robotic Exomusculature Glove with Integrated sEMG Sensing for Hand Rehabilitation %

Michael Delph, Sarah Fischer, Phillip Gauthier, Carlos Martinez Luna, Edward Clancy, Gregory Fischer

WPI

A6

3D Joystick for Robotic Arm Control by Individuals with High Level Spinal Cord Injuries % &

Hairong Jiang, Juan P. Wachs, Martin Pendergast, Bradley S. Duerstock

Purdue University

A7

Investigation of a passive inter-limb device on step-to-step transition of human walking % +

Jun-tian Zhang and Qingguo Li

Queen's University

A8

Stabilization of a Three-Dimensional Limit Cycle Walking Model through Step-to-Step Ankle % & Control

Myunghee Kim and Steven Collins

Carnegie Mellon University

A9

Human Motion Intention based Scaled Teleoperation for Orientation Assistance in Preshaping % , for Grasping

Karan Khokar, Redwan Algasemi, Sudeep Sarkar, Rajiv Dubey

University of South Florida

A10

Fuel Efficiency of a Portable Powered Ankle-Foot Orthosis B #5

Morgan K. Boes¹, Mazharul Islam², Yifan David Li², Elizabeth T. Hsiao-Wecksler²

¹Bioengineering Department, University of Illinois at Urbana-Champaign, ²Department of Mechanical Engineering and Science, University of Illinois at Urbana-Champaign

A11

Design and Control of a Two-Wheeled Robotic Walker for Balance Enhancement) (

Airton da Silva and Frank Sup

University of Massachusetts Amherst

A12

Differentiating Ability in Users of the ReWalk Powered Exoskeleton: An Analysis of Walking Kinematics ** \$

Mukul Talaty¹, Alberto Esquenazi¹, Jorge E. Briceño²

¹MossRehab, ²Universidad Simón Bolívar

A13

A framework to aid adoption of automated rehabilitation devices into clinical practice **)

Alastair Cozens¹, Bipin Bhakta², Therese Jackson¹, Katie Henderson¹, Shiona Brough¹, Fredericke van Wijk³, Sophie Makower², Christine Smith⁴

¹NHS Grampian, ²University of Leeds, ³Glasgow Caledonian University, ⁴University of Salford

A14

Development of an Elliptical Trainer with Real-Time Knee Adduction Moment Feedback **+%

Sang Hoon Kang¹, Song Joo Lee², Yupeng Ren³, Li-Qun Zhang¹

¹Rehabilitation Institute of Chicago/Northwestern University, ²Northwestern University, ³Rehabilitation Institute of Chicago

A15

VRACK: Measuring Pedal Kinematics During Stationary Bike Cycling **++

Amir B. Farjadian¹, Qingchao Kong¹, Venkata K. Gade², Judith E. Deutsch², Constantinos Mavroidis¹

¹Northeastern University, ²University of Medicine and Dentistry of New Jersey

A16

Robot-Assisted Balance Training for Gait Modification **, '

Seok Hun Kim and Kyle Reed

University of South Florida

A17

A Pivoting Elliptical Training System for Prevention and Rehabilitation of Musculoskeletal Injuries **, +

Yupeng Ren¹, Song Joo Lee², Hyung-Soon Park³, Li-Qun Zhang³

¹RIC, ²Northwestern University, ³RIC/Northwestern University

A18

Adaptation of Task Difficulty in Rehabilitation Exercises Based on the User's Motor Performance and Physiological Responses **-'

Navid Shirzad and H. F. Machiel Van der Loos

UBC Mechanical Engineering

A19

Improving the match between ability and challenge: toward a framework for automatic level adaptation in game-based assessment and training

Joel C. Perry, Sivakumar Balasubramanian, Cristina Rodriguez-de-Pablo, Thierry Keller
TECNALIA

A20

A Finger Exoskeleton for Rehabilitation and Brain Image Study

Zhenjin Tang, Shigeki Sugano, Hiroyasu Iwata
Waseda University

A21

Kinematics and Design of a Portable and Wearable Exoskeleton for Hand Rehabilitation

Marco Cempini, Stefano Marco Maria De Rossi, Tommaso Lenzi, Mario Cortese, Francesco Giovacchini, Nicola Vitiello, Maria Chiara Carrozza
Scuola Superiore Sant'Anna

A22

A Novel Framework for Virtual Prototyping of Rehabilitation Exoskeletons

Priyanshu Agarwal, Pei-Hsin Kuo, Richard Neptune, Ashish Deshpande
The University of Texas at Austin

A23

Design and Analysis of a Compliant Bimanual Rehabilitation Device

Samuel McAmis and Kyle Reed
University of South Florida

A24

Design of Wrist Gimbal: a Forearm and Wrist Exoskeleton for Stroke Rehabilitation

John A. Martinez, Paul Ng, Son Lu, McKenzie S. Campagna, Ozkan Celik
San Francisco State University

A25

Development of a Fuzzy Logic Based Intelligent System for Autonomous Guidance of Post-stroke Rehabilitation Exercise

Rajibul Huq¹, Rosalie Wang², Elaine Lu¹, Debbie Hébert³, Hervé Lacheray⁴, Alex Mihailidis³
¹University of Toronto, ²Toronto Rehabilitation Institute, ³University of Toronto & Toronto Rehabilitation Institute, ⁴Quanser Inc.

A26

Adaptive Control with State-Dependent Modeling of Patient Impairment for Robotic Movement Therapy

Curtis Bower, Hossein Taheri, Eric Wolbrecht
University of Idaho

A27

System Characterization of RiceWrist-S: a Forearm-Wrist Exoskeleton For Upper Extremity Rehabilitation

Ali Utku Pehlivan, Chad Rose, Marcia O'Malley
Rice University

A28

Restoring ADL Function after Wrist Surgery in Children with Cerebral Palsy: A Novel Bilateral Robot System Design

Devon Holley¹, Andrew Theriault¹, Sheku Kamara², Vince Anewenter², Daren Hughes³, Michelle J Johnson³
¹Marquette University, ²Milwaukee School of Engineering, ³Medical College of Wisconsin

Poster Session B

Monday, June 24, 2013

B1

A Novel Compact Compliant Actuator Design for Rehabilitation Robots

Haoyong Yu¹, Sunan Huang¹, Gong Chen¹, Nitish Thankor², Siew-Lok Toh¹, Manolo STA Cruz², Yassine Ghorbel³, Chi Zhu⁴

¹National University of Singapore, ²HOPE Technik Pte. Ltd, ³University of Stuttgart, ⁴Maebashi Institute of Technology

B2

Design of a series elastic actuator for a compliant parallel wrist rehabilitation robot

Fabrizio Sergi, Melissa M. Lee, Marcia K. O'Malley
Rice University

B3

Intelligent Control of a Smart Walker and its Performance Evaluation

Simon L. Grondin and Qingguo Li
Queen's University

B4

Development and Control of a Lower Extremity Assistive Device (LEAD) for Gait Rehabilitation

Bingquan Shen, Jinfu Li, Fengjun Bai, Chee-Meng Chew
National University of Singapore

B5

Non-Contact Capacitance Sensing for Continuous Locomotion Mode Recognition: Design Specifications and Experiments with An Amputee

Enhao Zheng¹, Long Wang¹, Yimin Luo², Kunlin Wei¹, Qining Wang¹
¹Peking University, ²NRC for Rehabilitation Tech. Aids

B6

Muscle Force Estimation Method with Surface EMG for a Lower Extremities Rehabilitation Device

Fengjun Bai, Chee-Meng Chew, Jinfu Li, Bingquan Shen, Tomasz Marek Lubecki
National University of Singapore

B7

A Quasi-Passive Compliant Stance Control Knee-Ankle-Foot Orthosis

Kamran Shamaei, Paul Napolitano, Aaron Dollar
Yale University

B8

An Egocentric Vision based Assistive Co-robot

Jingzhe Zhang, Lishuo Zhuang, Yang Wang, Yameng Zhou, Yan Meng, Gang Hua
Stevens Institute of Technology

B9

Adaptive Position Anticipation in a Support Robot for Overground Gait Training Enhances Transparency

Christophe Everarts¹, Heike Vallery², Marc Bolliger³, Renaud Ronsse¹

¹Université catholique de Louvain, ²Khalifa University of Science, Delft University of Technology and ETH Zurich, ³Balgrist University Hospital

B10

Improving the transparency of a rehabilitation robot by exploiting the cyclic behaviour of walking

Wietse van Dijk¹, Bram Koopman², Edwin van Asseldonk², Herman van der Kooij²

¹Delft University of Technology, ²University of Twente

B11

A Novel Body Weight Support System Extension: Initial Concept and Simulation Study

Andrew Pennycott, Heike Vallery, Dario Wyss, Markus Spindler, Antoine Dewarrat, Robert Riener

ETH Zurich

B12

A review of assistive devices for arm balancing

Gerard Dunning and Just Herder

Delft University of Technology

B13

A Rehabilitation Device to Improve the Hand Grasp Function of Stroke Patients using a Patient-Driven Approach

Wanjoo Park¹, Wookjin Jeong¹, Gyu-Hyun Kwon¹, Yun-Hee Kim², Laehyun Kim¹

¹Korea Institute of Science and Technology, ²Samsung Medical Center

B14

Towards Extended Virtual Presence of the Therapist in Stroke Rehabilitation

Hee-Tae Jung¹, Takeshi Takahashi¹, Yu-Kyong Choe¹, Jennifer Baird², Tammie Foster³, Roderic Grupen¹

¹University of Massachusetts Amherst, ²St. Ambrose University, ³Cooley Dickinson Hospital

B15

Development of a powered mobile module for the ArmAssist home-based telerehabilitation platform

Je Hyung Jung, David Valencia, Cristina Rodríguez-de-Pablo, Thierry Keller, Joel Perry

Rehabilitation Area, Health Division, TECNALIA

B16

Assist-as-needed path control for the PASCAL rehabilitation robot

Urs Keller, Georg Rauter, Robert Riener

Sensory-Motor Systems Lab, ETH Zürich, Switzerland

B17

Goal Orientated Stroke Rehabilitation Utilising Electrical Stimulation, Iterative Learning and Microsoft Kinect

Timothy Exell, Christopher Freeman, Katie Meadmore, Ann-Marie Hughes, Emma Hallowell, Mustafa

Kutlu, Jane Burridge, Eric Rogers

University of Southampton

B18

A feasibility study of the effect of multichannel electrical stimulation and gravity compensation on hand function in stroke patients: a pilot study

Thijs Krabben¹, Jaap H Buurke², Gerdienke B Prang¹, Johan S Rietman²

¹Roessingh Research & Development, ²University of Twente

B19

Pulsed assistance: a new paradigm of robot training

Dalia De Santis¹, Lorenzo Masia¹, Pietro Morasso¹, Valentina Squeri¹, Jacopo Zenzeri¹, Maura Casadio², Psiche Giannoni³, Assunta Riva⁴

¹RBCS Dept., Istituto Italiano di Tecnologia, ²DIBRIS, University of Genoa, ³ART - Education and Rehabilitation Center, ⁴SI4LIFE - Innovation hub for elderly and disabled people

B20

Towards a Parameterizable Exoskeleton for Training of Hand Function After Stroke

Patrick Weiss, Lars Heyer, Thomas F. Münte, Marcus Heldmann, Achim Schweikard, Erik Maehle
University of Lübeck, Germany

B21

Design of a self-aligning 3-DOF actuated exoskeleton for diagnosis and training of wrist and forearm after stroke

J. Houdijn Beekhuis, Ard J. Westerveld, Herman van der Kooij, Arno H.A. Stiene³
University of Twente

B22

SCRIPT Passive Orthosis: Design and Technical Evaluation of the Wrist and Hand Orthosis for Rehabilitation Training at Home

Serdar Ates¹, Joan Lobo-Prat¹, Piet Lammertse², Herman van der Kooij¹, Arno H. A. Stienen¹

¹University of Twente, ²MOOG B. V.

B23

Enhancing patient freedom in rehabilitation robotics using gaze-based intention detection

Domen Novak and Robert Riener
ETH Zurich, Sensory-Motor Systems Lab

B24

Using a high spatial resolution tactile sensor for intention detection

Claudio Castellini¹ and Risto Kõiva²
¹DLR - German Aerospace Center, ²Bielefeld University

B25

Whole-arm Tactile Sensing for Beneficial and Acceptable Contact During Robotic Assistance

Phillip Grice¹, Marc Killpack¹, Advait Jain², Sarvagya Vaish¹, Jeffrey Hawke¹, Charles Kemp¹

¹Georgia Institute of Technology, ²Redwood Robotics, Inc

B26

SQUID: Sensorized Shirt with Smartphone Interface for Exercise Monitoring and Home Rehabilitation

Amir B. Farjadian, Mark L. Sivak, Constantinos Mavroidis
Northeastern University

B27

Design of a Robotic Mobility System to Promote Socialization in Children

Xi Chen¹, Christina Ragonesi¹, James Galloway¹, Sunil Agrawal²

¹University of Delaware, ²Columbia University

B28

A Haptically Enhanced Painting as a Tool for Neurorehabilitation

Hoang H. Le¹, Rui C.V. Loureiro¹, Florian Dussopt², Nicholas Phillips³, Aleksander Zivanovic¹, Martin J. Loomes¹

¹Middlesex University, ²Florian Dussopt Design Studio, ³Nick Phillips Sound Studio

Poster Session C

Tuesday, June 25, 2013

C1

Paralyzed Subject Controls Telepresence Mobile Robot Using Novel sEMG Brain-Computer Interface: Case Study

Kenneth Lyons and Sanjay Joshi
University of California, Davis

C2

Brain Computer Interface based Robotic Rehabilitation with Online Modification of Task Speed

Mine Sarac, Ela Koyas, Ahmetcan Erdogan, Mujdat Cetin, Volkan Patoglu
Sabanci University

C3

A body machine interface for the control of a 2D cursor

Ismael Seanez and Ferdinando Mussa-Ivaldi
Northwestern University

C4

Toward Gesture Controlled Wheelchair: A Proof of Concept Study

Noriyuki Kawarazaki¹, Dimitar Stefanov², Alejandro Diaz¹
¹Kanagawa Institute of technology, ²Coventry University

C5

A Wheelchair Operation Assistance Control for a Wearable Robot Using the User's Residual Function

Naoto Mizutani¹, Tatsuya Watanabe², Ken'ichi Yano¹, Takaaki Aoki³, Yutaka Nishimoto², Yasuyuki Kobayashi⁴
¹Mie University, ²Gifu University, ³Gifu University Hospital, ⁴LUMINOUS JAPAN CO.,LTD.

C6

A Five-wheel Wheelchair with an Active-caster Drive System

Yu Munakata, Aki Tanaka, Masayoshi Wada
Tokyo Univ. of Agriculture and Technology

C7

Determining Navigability of Terrain Using Point Cloud Data

Stephanie Cockrell, Gregory Lee, Wyatt Newman
Case Western Reserve University

C8

Using Machine Learning to Blend Human and Robot Controls for Assisted Wheelchair Navigation

Aditya Gail¹, Matthew Derry¹, Brenna Argall²
¹Northwestern University, ²Northwestern University and Rehabilitation Institute of Chicago

C9

A Depressurization Assistance System with a Suitable Posture for a Seated Patient on a Wheelchair

Kenji Shiotani¹, Daisuke Chugo¹, Yuki Sakaida², Sho Yokota³, Hiroshi Hashimoto⁴
¹Kwansei Gakuin Univ., ²RIKEN, ³Setsunan Univ., ⁴Advanced Inst. of Industrial Tech.

C10

Autonomous Function of Wheelchair-Mounted Robotic Manipulators to Perform Daily Activities ¹,
Cheng-Shiu Chung, Hongwu Wang, Rory Cooper
University of Pittsburgh

C11

Development and Preliminary Testing of a Novel Wheelchair Integrated Exercise/ Rehabilitation System
Beomsoo Hwang and Doyoung Jeon
Sogang University

C12

Concept Proposal for a Detachable Exoskeleton-Wheelchair to Improve Mobility and Health
Jaimie Borisoff, Johanne Mattie, Vince Rafer
British Columbia Institute of Technology

C13

Rehabilitation Robotics Ontology on the Cloud
Zeynep Dogmus¹, Agis Papantoniou², Muhammed Kilinc³, Sibel Yildirim³, Esra Erdem¹, Volkan Patoglu¹
¹Sabancı University, ²National Technical University of Athens, ³Hacettepe University

C14

Intentional Movement Performance Ability (IMPA): A Method for Robot-Aided Quantitative Assessment of Motor Function
Sung Yul Shin¹, Jung Yoon Kim², Sanghyeop Lee¹, Junwon Lee¹, Seung-Jong Kim¹, ChangHwan Kim¹
¹Korea Institute of Science and Technology, ²National Rehabilitation Center, Korea

C15

Analysis of grasping strategies and function in hemiparetic patients using an instrumented object
Nathanael Jarrassé¹, Markus Kuehne¹, Nick Roach², Asif Hussain², Sivakumar Balasubramanian³, Etienne Burdet², Agnès Roby-Brami¹
¹Institute of Intelligent Systems and Robotics, University Pierre et Marie Curie, CNRS - UMR,
²Department of Bioengineering, Imperial College of Science, Technology and Medicine,
³Tecnalia, Derio (Bizkaia), Spain

C16

Characterizing Coordination of Grasp and Twist in Hand Function of Healthy and Post-stroke Subjects
Hamed Kazemi, Robert Kearney, Theodore Milner
McGill University

C17

Prediction of Stroke-related Diagnostic and Prognostic Measures Using Robot-Based Evaluation
Sayyed Mostafa Mostafavi¹, Janice Glasgow¹, Stephen Scott¹, Sean Dukelow², Parvin Mousavi¹
¹Queen's University, ²University of Calgary

C18

Robotic Unilateral and Bilateral Upper-Limb Movement Training for Stroke Survivors Afflicted by Chronic Hemiparesis
Matt Simkins¹, Hyunchul Kim¹, Gary Abrams², Nancy Byl², Jacob Rosen¹
¹UCSF, ²UCSF

C19

An inverse dynamic analysis on the influence of upper limb gravity compensation during reaching

J.M.N. (Hans) Essers¹, Alessio Murgia², Arjen Bergsma³, Paul Verstegen⁴, Kenneth Meijer¹

¹Department of Human Movement Sciences, Maastricht University Medical Centre +, ²Center for Human Movement Sciences, University Medical Center Groningen, ³Department of Rehabilitation, Nijmegen Center for Evidence Based Practice, Radboud University Nijmegen Medical Centre and Department of Human Movement Sciences, Maastricht University Medical Centre +, ⁴Focal Meditech BV

C20

PARO Robot Affects Diverse Interaction Modalities in Group Sensory Therapy for Older Adults with Dementia

Selma Sabanovic¹, Casey Bennett², Wan-Ling Chang¹, Lesa Huber¹

¹Indiana University, ²Indiana University; Centerstone Research Institute

C21

Development of a Novel Evidence-Based Automated Powered Mobility Device Competency Assessment

Jaime Valls Miro¹, Ross Black², Bojan Andonovski¹, Gamini Dissanayake¹

¹UTS, ²Prince of Wales Hospital

C22

Preliminary evaluation of SensHand V1 in assessing motor skills performance in Parkinson Disease

Filippo Cavallo¹, Carlo Maremmani², Dario Esposito¹, Erika Rovini¹, Michela Aquilano¹, Paolo Bongioanni³, Maria Chiara Carrozza¹, Paolo Dario¹

¹Scuola Superiore Sant'Anna, ²Area Health Authority District 1 of Massa Carrara, ³Azienda Ospedaliero-Universitaria Pisana, Neurocare Onlus

C23

Development of the iPAM MkII System and Description of a Randomized Controlled Trial with Acute Stroke Patients

Andrew Jackson¹, Martin Levesley¹, Sophie Makower², Alastair Cozens³, Bipinchandra Bhakta⁴

¹University of Leeds, ²Leeds Community Healthcare NHS Trust, ³Grampian NHS, ⁴Leeds Teaching Hospitals Trust, UK

C24

Effects of upper limb robot-assisted therapy on motor recovery of subacute stroke patients: a kinematic approach

Stefano Mazzoleni¹, Patrizio Sale², Micol Tiboni³, Marco Franceschini², Maria Chiara Carrozza¹, Federico Posteraro³

¹Scuola Superiore Sant'Anna, ²IRCCS San Raffaele Pisana, ³Auxilium Vitae Rehabilitation Centre

C25

Performance of Daily Activities by Older Adults with Dementia: The Role of an Assistive Robot

Momotaz Begum¹, Rosalie Wang¹, Rajibul Huq², Alex Mihailidis²

¹Toronto Rehab, ²University of Toronto

C26

Selecting Services for a Service Robot - Evaluating the problematic activities threatening the independence of elderly persons

Sandra Bedaf^{1,2}, Gert Jan Gelderblom¹, Luc de Witte^{1,2}, Dag Syrdal², Hagen Lehmann², Farshid Amirabdollahian², Kerstin Dautenhahn², David Hewson³

¹Zuyd University of Applied Sciences, ²University of Hertfordshire, ³University of Technology of Troyes

C27

Initial Development of Direct Interaction for a Transfer Robotic Arm System for Caregivers (- (Hervens Jeannis, Garrett Grindle, Annmarie Kelleher, Hongwu Wang, Bambi Brewer, Rory Cooper
The University of Pittsburgh

C28

Study on a Practical Robotic Follower to Support Home Oxygen Therapy Patients - Question- (- - naire-Based Concept Evaluation by the Patients

Gen Endo¹, Masatsugu Iribe², Yu Iemura¹, Ryota Ikeda³, Kohei Onishi³, Naoto Maeda³, Eduardo F. Fukushima¹, Shigeo Hirose¹, Mineko Ohira⁴, Toshio Takubo⁵

¹Tokyo Institute of Technology, ²Osaka Electro-Communication University, ³Osaka Electro-Communication,

⁴East Nagano Hospital / a Meeting for the Pulmonary Rehabilitation Studies in Hokushin, ⁵Tokyo Women's Medical University

Poster Session D

Tuesday, June 25, 2013

D1

Ankle-Knee Prosthesis with Powered Ankle and Energy Transfer for CYBERLEGS α -Prototype. () S(

Joost Geeroms, Louis Flynn, Rene Jimenez-Fabian, Bram Vanderborght, Dirk Lefeber
Vrije Universiteit Brussel

D2

Strategies to reduce the configuration time for a powered knee and ankle prosthesis across multiple ambulation modes () %

Ann Simon¹, Nicholas Fey¹, Suzanne Finucane², Robert Lipschutz¹, Levi Hargrove¹

¹Center for Bionic Medicine, Rehabilitation Institute of Chicago and Department of Physical Medicine and Rehabilitation, Northwestern University, ²Center for Bionic Medicine, Rehabilitation Institute of Chicago

D3

Effects of a powered ankle-foot prosthesis on kinetic loading of the contralateral limb: A case () % series

David Hill and Hugh Herr
Massachusetts Institute of Technology

D4

Clutchable Series-Elastic Actuator: Design of a Robotic Knee Prosthesis for Minimum Energy () && Consumption

Elliott Rouse, Luke Mooney, Ernesto Martinez-Villalpando, Hugh Herr
MIT

D5

EMG Control of a Bionic Knee Prosthesis: Exploiting Muscle Co-Contraction for Improved Loco- () & motor Function

James Dawley, Kevin Fite, George Fulk
Clarkson University

D6

Modeling of WalkMECH: a Fully-Passive Energy-Efficient Transfemoral Prosthesis Prototype () (
Ramazan Unal, Feite Klijnstra, Bram Burkink, Sebastiaan Behrens, Edsko Hekman, Stefano Stramiglio, Bart Koopman, Raffaella Carloni
 University of Twente

D7

Novel Knee Joint Mechanism of Transfemoral Prosthesis for Stair Ascent () (\$
Koh Inoue¹, Takahiro Wada², Ryuichi Harada¹, Shinichi Tachiwana¹
¹Kagawa University, ²Ritsumeikan University

D8

Redefining Prosthetic Ankle Mechanics, Non-Anthropomorphic Ankle Design () (*
Andrew LaPre and Frank Sup
 University of Massachusetts Amherst

D9

Novel Differential Mechanism Enabling Two DOF from a Single Actuator: Application to a Prosthetic Hand () () %
Joseph Belter and Aaron Dollar
 Yale University

D10

Continuously-Variable Series-Elastic Actuator () () +
Luke Mooney and Hugh Herr
 MIT

D11

Sleeve Muscle Actuator and Its Application in Transtibial Prostheses () () *'
Hao Zheng and Xiangrong Shen
 The University of Alabama

D12

Multimodal Sensor Controlled Three Degree of Freedom Transradial Prosthesis () () * ,
Kengo Ohnishi¹, Isamu Kajitani², Toshiyuki Morio³, Tomoo Takagi³
¹Tokyo Denki University, ²National Inst. of Adv Industrial Science & Technology, ³Okayama Prefectural University

D13

Proportional EMG Control of Ankle Plantar Flexion in a Powered Transtibial Prosthesis () () +
Jing Wang, Oliver A. Kannape, Hugh M. Herr
 Massachusetts Institute of Technology

D14

Does it pay to have a damper in a powered ankle prosthesis? A Power-Energy Perspective () () +
Mahdy Eslamy, Martin Grimmer, Stephan Rinderknecht, Andre Seyfarth
 TU Darmstadt

D15

Myoelectric Neural Interface Enables Accurate Control of a Virtual Multiple Degree-Of-Freedom Foot-Ankle Prosthesis () () , +
Dennis Tkach, Robert Lipschutz, Suzanne Finucane, Levi Hargrove
 Rehabilitation Institute of Chicago

D16

Pattern Recognition of Hand Movements with Low Density sEMG for Prosthesis Control Purposes

JOHN JAIRO VILLAREJO MAYOR, JHON FREDDY SARMIENTO VELA, ANSELMO FRIZERA NETO, TEODIANO FREIRE BASTOS FILHO

Universidade Federal do Espírito Santo

D17

Recognition of Hand Movements in a Trans-Radial Amputated Subject by sEMG

Manfred Atzori¹, Micheal Baechler², Henning Müller¹

¹University of Applied Sciences Western Switzerland, ²University of Fribourg

D18

A synergy-driven approach to a myoelectric hand

Sasha Blue Godfrey¹, Arash Ajoudani¹, Manuel Catalano², Giorgio Grioli², Antonio Bicchi²

¹Istituto Italiano di Tecnologia, ²University of Pisa and Istituto Italiano di Tecnologia

D19

Task Discrimination from Myoelectric Activity: A Learning Scheme for EMG-Based Interfaces

Minas Liarokapis¹, Panagiotis Artemiadis², Kostas Kyriakopoulos¹

¹National Technical University of Athens, ²Arizona State University

D20

Evaluating subsampling strategies for sEMG-based prediction of voluntary muscle contractions

Risto Kõiva¹, Barbara Hilsenbeck², Claudio Castellini²

¹Bielefeld University, ²DLR - German Aerospace Center

D21

Body sensor network-based strapdown orientation estimation: Application to human locomotion

Berno J.E. Misgeld¹, Daniel Rueschen¹, Saim Kim², Steffen Leonhardt¹

¹RWTH Aachen University, ²MELAG Medizintechnik oHG

D22

Design of a Wearable Perturbator for Human Knee Impedance Estimation during Gait

Michael Tucker, Adrian Moser, Olivier Lamercy, James Sulzer, Roger Gassert

ETH Zurich

D23

Design of An Expert System to Automatically Calibrate Impedance Control for Powered Knee Prostheses

Ding Wang, Ming Liu, Fan Zhang, He Huang

University of Rhode Island

D24

Measuring the Dynamic Impedance of the Human Arm Without a Force Sensor

Matthew Dyck and Mahdi Tavakoli

University of Alberta

D25

Effect of age on stiffness modulation during postural maintenance of the arm

Tricia Gibo¹, Amy Bastian², Allison Okamura³

¹Johns Hopkins University, ²Kennedy Krieger; Johns Hopkins School of Medicine, ³Stanford University

D26

Haptic recognition of dystonia and spasticity in simulated multi-joint hypertonia ^{***}) &

*Daide Piovesan^{*1}, Alejandro Melendez-Calderon^{*1}, Ferdinando A. Mussa-Ivaldi²*

¹Rehabilitation Institute of Chicago, ²Northwestern University

D27

Reward-based learning of a redundant task ^{***}),

Irene Tamagnone, Maura Casadio, Vittorio Sanguineti

University of Genoa

D28

Adaptation to Visuomotor Rotation in Isometric Reaching is Similar to Movement Adaptation ^{***1}

Michele F. Rotella¹, Margaret Koehler¹, Ilana Nisky¹, Amy J. Bastian², Allison M. Okamura¹

¹Department of Mechanical Engineering, Stanford University, ²Kennedy Krieger Institute and Department of Neuroscience, Johns Hopkins University

D29

Real-time Prediction Learning for the Simultaneous Actuation of Multiple Prosthetic Joints ^{***-}

Patrick M. Pilarski, Travis B. Dick, Richard S. Sutton

University of Alberta

Poster Session E

Wednesday, June 26, 2013

E1

High level functions for the intuitive use of an assistive robot ^{**++}

Olivier Lebec¹, Mohamed Walid Ben ghezala¹, Violaine Leynart², Isabelle Laffont³, Charles Fattal², Christophe Leroux⁴, Laurence Devillers⁴, Clément Chastagnol⁴, Jean-Claude Martin⁴, Youcef Mezouar⁵, Hermanth Korrapatti⁵, Vincent Dupourque⁶

¹CEA-LIST, ²APPROCHE, ³CHU Montpellier, ⁴LIMSI, ⁵Institut PASCAL, ⁶ROBOSOFT

E2

Usability Test of KNRC Self-Feeding Robot ^{*, '}

Won-Kyung Song, Won-Jin Song, Yale Kim, Jongbae Kim

National Rehabilitation Center, Korea

E3

Optimal Design of an Alignment-Free Two-DOF Rehabilitation Robot for the Shoulder Complex ^{*, ,}

Daniel Galinski, Julien Sapin, Dehez Bruno

Université catholique de Louvain

E4

Model-Based Safety Analysis of Human-Robot Interactions: the MIRAS Walking Assistance Robot ^{**-)}

Jeremie Guiochet, Quynh Anh Do Hoang, Mohamed Kaaniche, David Powell

LAAS-CNRS

E5

Human-Robot Interaction Tests on a Novel Robot for Gait Assistance ^{++S&}

Nevio Luigi Tagliamonte¹, Fabrizio Sergi², Giorgio Carpino¹, Dino Accoto¹, Eugenio Guglielmelli¹

¹Università Campus Bio-Medico di Roma, ²Rice University

E6

An intrinsically safe mechanism for physically coupling humans with robots ++\$,

Gerald O'Neill, Harshil Patel, Panagiotis Artemiadis
Arizona State University

E7

Adaptive Model-Based Assistive Control for Pneumatic Direct Driven Soft Rehabilitation Robots ++%

André Wilkening¹ and Oleg Ivlev²

¹FWBI Friedrich-Wilhelm-Bessel-Institute Research Company and University of Bremen, Institute of Automation, ²Friedrich-Wilhelm-Bessel-Institute Research Company

E8

Human-Robot-Interaction Control for Orthoses with Pneumatic Soft-Actuators - Concept and Initial Trials ++%

David Baiden¹ and Oleg Ivlev²

¹Friedrich-Wilhelm-Bessel-Institute and University of Bremen, Institute of Automation, ²Friedrich-Wilhelm-Bessel-Institute

E9

Development of an orthosis for walking assistance using pneumatic artificial muscle ++&

Takuma Kawamura, Kenta Takanaka, Taro Nakamura, Hisashi Osumi
Chuo University

E10

Development of an Assistive Motorized Hip Orthosis ++' %

Jeremy Olivier, Mohamed Bouri, Amalric Ortlieb, Hannes Bleuler, Reymond Clavel
EPFL

E11

A New Powered Orthosis with Hip and Ankle Linkage for Paraplegics Walking ++' *

Chikara Nagai¹, Shinnosuke Hisada¹, Goro Obinata¹, Eiichi Genda²

¹Nagoya University, ²Minami Seikyo Hospital

E12

Asymmetric Adaptation in Human Walking using the Tethered Pelvic Assist Device (TPAD) ++(%

Vineet Vashista¹, Darcy Reisman², Sunil Agrawal¹

¹Columbia University, ²University of Delaware

E13

Lateral balance control for robotic gait training. ++(*

Bram Koopman, Jos Meuleman, Edwin van Asseldonk, Herman van der Kooij
University of Twente

E14

Design of Variable-Damping Control for Prosthetic Knee based on a Simulated Biped ++&)

Jie Zhao¹, Karsten Berns¹, Roberto Baptista², Antonio Bo²

¹University of Kaiserslautern, ²University of Brasilia

E15

Gait Mode Recognition and Control for a Portable-Powered Ankle-Foot Orthosis ++),

Yifan Li and Elizabeth Hsiao-Weckslar
UIUC

E16

Functional Evaluation of Robot End-Point Assisted Gait re-Education in Chronic Stroke Survivors ^{1,2,3,*}

Alice De Luca¹, Carmelo Lentino¹, Honorè Vernetti¹, Giovanni Antonio Checchia¹, Psiche Giannoni², Pietro Morasso³, Maura Casadio⁴

¹Rehabilitation and Functional Reeducation Unit, Santa Corona Hospital, ASL2 Savonese, Pietra Ligure, Italy, ²ART Education and Rehabilitation Center, Genoa, Italy, ³RBCS department, Istituto Italiano di Tecnologia, Genoa, Italy, ⁴Dept of Informatics, Bioengineering, Robotics and System Engineering, University of Genoa Genoa, Italy

E17

Novel actuation design of a gait trainer with shadow leg approach ^{1,2,3}

Jos Meuleman¹, Edwin van Asseldonk², Herman van der Kooij²

¹Moog, ²University of Twente

E18

Brief Biomechanical Analysis on the Walking of Spinal Cord Injury Patients with a Lower Limb Exoskeleton Robot ^{1,2,*}

Jung Jun-Young¹, Park Hyunsub¹, Yang Hyun-Dae², Chae Mingi²

¹Korea Institute of Industrial Technology, ²University of Science and Technology

E19

Selecting the best number of synergies in gait: preliminary results on young and elderly people ^{1,2,*}

Fiorenzo Artoni¹, Vito Monaco¹, Silvestro Micera²

¹The Biorobotics Institute, Scuola Superiore Sant'Anna, Pisa, Italy, ²The Biorobotics Institute, Scuola Superiore Sant'Anna, Pisa, Italy; Translational Neural Engineering Laboratory, Center of Neuroprosthetics, Swiss Federal Institute of Technology, Lausanne, Switzerland

E20

Preliminary Tests of a Prototype FES Control System for Cycling Wheelchair Rehabilitation ^{1,2,*}

Takashi Watanabe, Takuya Murakami, Yasunobu Handa

Tohoku University

E21

Dynamic arm supports ^{1,2,3}

Loek van der Heide¹, Gert Jan Gelderblom², Luc de Witte¹

¹Zuyd University of Applied sciences and School for public health and primary care, ²Zuyd University of applied sciences

E22

Design of a perfect balance system for active upper-extremity exoskeletons ^{1,2,*}

Richard L. Smith, Joan Lobo-Prat, Herman van der Kooij, Arno H.A. Stienen

University of Twente

E23

Using the Kinect to Limit Abnormal Kinematics and Compensation Strategies During Therapy with End Effector Robots ^{1,2,3,*}

Elizabeth Brokaw¹, Peter Lum², Rory Cooper³, Bambi Brewer¹

¹The University of Pittsburgh, ²The Catholic University of America and the National Rehabilitation Hospital,

³The Department of Veteran Affairs and the University of Pittsburgh

E24

Performance based upper extremity training: a pilot study evaluation with the GENTLE/A rehabilitation system ; , %

Radhika Chemuturi, Farshid Amirabdollahian, Kerstin Dautenhahn
University of Hertfordshire

E25

Electrical Stimulation and Iterative Learning Control for Functional Recovery in the Upper Limb Post-Stroke ; , & %

Katie Meadmore, Timothy Exell, Emma Hallewell, Christopher Freeman, Ann-Marie Hughes, Mustafa Kutlu, Jane Burrridge, Eric Rogers
University of Southampton

E26

Passive-type Rehabilitation System for Upper Limbs Which Can Display the Exact Resistance Force in the Orientation Opposite to Hand Motion ; , & *

Makoto Haraguchi and Junji Furusho
Fukui University of Technology

E27

BIOMimetic Hand Extendon Device (BIOMHED) for Functional Hand Rehabilitation in Stroke ; , ' &

Sang Wook Lee¹, Katlin Landers¹, Hyung-Soon Park²
¹Catholic University of America, ²National Institutes of Health

E28

Fine Finger Motor Skill Training with Exoskeleton Robotic Hand in Chronic Stroke ; , ' *

Corinna Ockenfeld, Raymond K.Y. Tong, Evan A. Susanto, Sze-Kit Ho, Xiao-ling Hu
Hong Kong Polytechnic University

Podium Sessions — ICORR 2013

Podium Session 1

Upper Limb Functional Assessment and Rehabilitation

Monday, June 24, 2013, 11:15-12:30

Session Chairs: Jules Dewald and Gert Jan Gelderblom

Non-Contact versus Contact-based Sensing Methodologies for In-Home Upper Arm Robotic Rehabilitation

Ayanna Howard¹, Douglas Brooks¹, Edward Brown², Adey Gebregiorgis², Yu-Ping Chen³

¹Georgia Institute of Technology, ²Rochester Institute of Technology, ³Georgia State University

Application of arm support training in sub-acute stroke rehabilitation: first results on effectiveness and user experiences

Gerdienke B. Prange, Anke I. R. Kottink, Jaap H. Buurke, Johannes S. Rietman
Roessingh Research and Development

Assessment of upper limb motor function in patients with Multiple Sclerosis using the Virtual Peg Insertion Test: a pilot study

Olivier Lamercy¹, Marie-Christine Fluet¹, Ilse Lamers², Lore Kerkhofs³, Peter Feys², Roger Gassert¹

¹ETH Zurich, ²Hasselt University, ³Rehabilitation & MS Center Overpelt

The Manometer: A non-obtrusive wearable device for monitoring spontaneous use of the wrist and fingers

Justin Rowe, Nizan Friedman, Mark Bachman, David Reinkensmeyer
University of California, Irvine

Effort, performance, and motivation: Insights from robot-assisted training of human golf putting and rat grip strength

Jaime Duarte, Berkey Gebrekristos, Sergi Perez, Justin Rowe, Kelli Sharp, David Reinkensmeyer
University of California, Irvine

Podium Session 2

Actuators And Hand Exoskeleton Design

Monday, June 24, 2013, 17:00-18:00

Session Chairs: Farshid Amirabdollahian and Roger Gassert

A Pediatric Robotic Thumb Exoskeleton for at-Home Rehabilitation The Isolated Orthosis for Thumb Actuation (IOTA)

Patrick M. Aubin¹, Hani Sallum¹, Conor Walsh¹, Annette Correia², Leia Stirling¹

¹The Wyss Institute at Harvard University, ²Boston Children's Hospital

CARAPACE: a novel Composite Advanced Robotic Actuator Powering Assistive Compliant Exoskeleton: Preliminary Design

Lorenzo Masia¹, Xavier Lachenal², Alberto Pirrera², Leonardo Cappello¹, Filippo Mattioni³, Paul Weaver², Pietro Morasso¹

¹Istituto Italiano di Tecnologia, ²University of Bristol, ³Hengshen Carbon Fibre

Hyperstaticity for Ergonomic Design of a Wrist Exoskeleton ^{1,2,3}

Mohammad Esmaeili^{1,2,3}, Nathanael Jarrase², Wayne Dailey³, Etienne Burdet³, Domenico Campolo¹

¹School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore, ²Institute of Intelligent Systems and Robotics, University Pierre et Marie Curie, CNRS - UMR 7222, ³Department of Bioengineering, Imperial College of Science, Technology and Medicine, London

Modeling, Design, and Optimization of Mindwalker Series Elastic Joint ^{1,2}

Shiqian Wang¹, Cor Meijneke¹, Herman van der Kooij²

¹Delft University of Technology, ²Delft University of Technology; Biomechatronics and Rehabilitation Technology

Podium Session 3

Assistive Devices and Simulators

Tuesday, June 25, 2013, 11:15-12:30

Session Chairs: Dimitar Stefanov and Marcia O'Malley

Advanced Augmented White Cane with Obstacle Height and Distance Feedback ^{1,2}

Rosali Pyun¹, Yeongmi Kim¹, Pascal Wespe¹, Stefan Schneller², Roger Gassert¹

¹ETH Zurich, ²Zurich University of the Arts

Lever-actuated resonance assistance (LARA): A wheelchair-based method for upper extremity therapy and overground ambulation for people with severe arm impairment ^{1,2}

Daniel Zondervan¹, Brendan Smith¹, David Reinkensmeyer²
UC Irvine

Designing Speech-Based Interfaces for Telepresence Robots for People with Disabilities ^{1,2}

Katherine Tsui¹, Kelsey Flynn¹, Amelia McHugh¹, Holly Yanco¹, David Kontak²

¹University of Massachusetts Lowell, ²Crotched Mountain Rehabilitation Center

Therapist recognition of impaired muscle groups in simulated multi-joint hypertonia ^{1,2}

Alejandro Melendez-Calderon¹, Davide Piovesan¹, Ferdinando A. Mussa-Ivaldi²

¹Rehabilitation Institute of Chicago, ²Northwestern University

Integrated Vision-Based Robotic Arm Interface for Operators with Upper Limb Mobility Impairments ^{1,2}

Hairong Jiang¹, Juan P. Wachs¹, Bradley S. Duerstock²

Purdue University

Podium Session 4 **Lower Limb Training and Gait Assistance**

Tuesday, June 25, 2013, 14:00-15:30

Session Chairs: Won-Kyung Song and Helen (He) Huang

Inducing self-selected human engagement in robotic locomotion training &

Steven H. Collins and Rachel W. Jackson

Carnegie Mellon University

A Preliminary Study into the Effects of Pelvic Rotations on Upper Body Lateral Translation &

Andrew Pennycott, Dario Wyss, Robert Riener, Heike Vallery

ETH Zurich

Robotic-Locomotor Training as a Tool to Reduce Neuromuscular Abnormality in Spinal Cord Injury - The Application of System Identification and Advanced Longitudinal Modeling &

Mehdi Mirbagheri¹, Matthew Kindig², Xun Niu¹, Deborah Varoqui¹, Petra Conaway²

¹Northwestern University/Rehabilitation Institute of Chicago, ²Rehabilitation Institute of Chicago

Development of an Energy Harvesting Backpack and Performance Evaluation &

Michael Shepertycky, Jun-Tian Zhang, Yan-Fei Liu, Qingguo Li

Queen's University

Experimental Effective Shape Control of a Powered Transfemoral Prosthesis &

Robert Gregg¹, Tommaso Lenzi², Nicholas Fey², Levi Hargrove², Jonathon Sensinger²

¹University of Texas at Dallas, ²Rehabilitation Institute of Chicago

Modulation of Anticipatory Postural Adjustments of Gait Using a Portable Powered Ankle-Foot Orthosis &

Matthew Petrucci¹, Colum MacKinnon², Elizabeth Hsiao-Wecksler¹

¹University of Illinois Urbana-Champaign, ²University of Minnesota

Podium Session 5 **Gait Exoskeleton Design**

Tuesday, June 25, 2013, 17:00-18:00

Session Chairs: Jaimie Borisoff and Gery Colombo

Multidirectional Transparent Support for Overground Gait Training &

Heike Vallery¹, Peter Lutz², Joachim von Zitzewitz³, Georg Rauter⁴, Michael Fritsch⁵, Christophe Everarts⁶, Renaud Ronsse⁶, Armin Curt⁷, Marc Bolliger⁷

¹TU Delft, The Netherlands, ²Lutz Medical Engineering, Switzerland, ³EPFL Lausanne, Switzerland, ⁴ETH Zurich, Switzerland, ⁵Khalifa University, UAE, ⁶UCLouvain, Belgium, ⁷University of Zurich, Switzerland

Improving Transparency of Powered Exoskeletons Using Force/Torque Sensors on the Supporting Cuffs &

Damiano Zanotto¹, Tommaso Lenzi², Paul Stegall¹, Sunil Agrawal³

¹Univ. of Delaware, ²Rehabilitation Institute of Chicago, ³Columbia University

Leveraging Gait Dynamics to Improve Efficiency and Performance of Powered Hip Exoskeletons ^{1,2},

Matthew Ryder and Frank Sup
University of Massachusetts

Biologically-inspired Soft Exosuit ^{1,2}, (

Alan Asbeck, Robert Dyer, Arnar Larusson, Conor Walsh
Harvard University

Podium Session 6

Methods for Classifying and Deciding in Rehabilitation and Assistance

Wednesday, June 26, 2013, 11:15-12:30

Session Chairs: Steve Collins and Elizabeth Hsiao-Weeksler

Delineating the whole brain BOLD response to passive movement kinematics ^{1,2,3,4,5} &

James Sulzer¹, Julio Dueñas¹, Philipp Stämpfli², Marie-Claude Hepp-Reymond³, Spyros Kollias⁴, Erich Seifritz⁵, Roger Gassert¹

¹Swiss Federal Institute of Technology, ETHZ, ²Zurich University Hospital for Psychiatry and the Department of Child and Adolescent Psychiatry, ³University of Zurich and ETHZ, ⁴University Hospital Zurich, ⁵Zurich University Hospital for Psychiatry

Exploiting Accelerometers to Improve Movement Classification for Prosthetics ^{1,2,3} +

Arjan Gijssberts and Barbara Caputo
Idiap Research Institute

Impact of Robot-mediated Interaction System on Joint Attention Skills for Children with Autism ^{1,2,3,4,5,6} &

Zhi Zheng, Lian Zhang, Esubalew Bekele, Amy Swanson, Julie Crittendon, Zachary Warren, Nilanjan Sarkar
Vanderbilt University

Individual patterns of motor deficits evident in movement distribution analysis ^{1,2,3} &

Felix Huang¹ and James Patton²

¹Northwestern University and Rehabilitation Institute of Chicago, ²University of Illinois at Chicago, & the Rehabilitation Institute of Chicago