ICNR 2016

International Conference on Neurorehabilitation

La Granja de San Ildefonso
Segovia, Spain
18-21 October

NRG

INSTITUTO CAJAL

CSIC

UNIVERSITAS Miguel Hernández

BMI Lab

TABLE OF CONTENTS

About ICNR.....1
Letter from the ICNR Conference Chairs.....2
Program at a glance.....3
General conference information.....4
Floor plans.....7
Conference committees.....8
Special events and meetings.....11
Conference excursion.....12
Pre-conference workshops – oct 18.....14
ICNR 2016 program – oct 19-21.....26
Plenary lectures.....40
Awards.....45
Poster session.....46
Exhibitor plan.....51

ABOUT ICNR

Restoring human sensory, motor and cognitive functions has been a fascinating research area during the last century. Interfacing the human nervous system with electronic and mechatronic systems to restore or compensate the neural function of patients is facing its crucial passage between research and actual clinical reality.

The 2016 International Conference on Neurorehabilitation brings together researchers and students from the fields of Clinical Rehabilitation, Applied Neurophysiology and Biomedical and Neural Engineering to promote, feed and encourage this therapeutic global shift. Moreover, the conference is held in parallel with the International Symposium on Wearable Robotics, which brings together researchers and innovators from all around the world to discuss novel approaches, challenges and potential solutions in technologies for wearable robots, especially in the clinical field.

LETTER FROM THE ICNR CONFERENCE CHAIRS

Dear Colleagues,

It is a great pleasure to welcome you to the 3rd International Conference on NeuroRehabilitation (ICNR2016) to be held in 'La Granja de San Ildefonso', Segovia (Spain) from October 18-21, 2016. After the success of ICNR2012 (Toledo, Spain) and ICNR2014 (Aalborg, Denmark), ICNR2016 brings together global research, clinical and industrial communities to a forum where the current status and future trends in Neural Rehabilitation will be discussed from scientific, clinical and translational perspectives.

ICNR will cover a wide range of topics in the field of Neurorehabilitation, such as neuromodulation, reflex operant conditioning, brain-machine interfaces in motor rehabilitation, motor and sensory facilitation, neurophysiological mechanisms, brain stimulation, neural signal processing, neuromuscular systems, motor neuroprosthetics, robotics, prosthetics, orthotics, neural interfaces, assistive technologies, neuro-musculoskeletal modelling, biomechanics and movement analysis, clinical needs, assessment and management of spasticity, assessment of the pathological brain, translational aspects, etc.

The scientific program will start on October 18th with more than 10 workshops. From October 19th to 21th, ICNR2016 will feature oral and poster sessions, and demonstrations in over 40 sessions. Furthermore, 8 plenary lectures will be given: 2 lectures on October 19th, 4 lectures on October 20th, and 2 lectures on October 21th. We hope that you will be able of attending many of these exciting presentations and have stimulating discussions with your colleagues.

We would like to thank all the members of the steering committee, the organizing committee and the scientific, clinical and industrial program committees. We are especially grateful to all authors, reviewers and sponsors for their effort and valuable support to make ICNR2016 a reality.

Finally, note that ICNR2016 Proceedings will be published by Springer. Digital copies can be downloaded (as of October, 16th for 1 month) from the Springer website with your personal code (see instructions in page 6).

Once again, welcome to ICNR2016!

José L. Pons, PhD
Conference Chair

José M. Azorín, PhD
Conference Chair

PROGRAM AT A GLANCE

	Tuesday 18							Wednesday 19					Thursday 20				Friday 21			
8:30-9:00								Plenary - A. Pascual-Leone Room A					Plenary - D. Farina Room A				Plenary - M. Molinari Room A			
9:00-9:20	Opening session (Room A)																			
9:20-9:40	Ekso Bionics demonstration (Hall -1)							Neuroelectrics demonstration (Hall -1)					Technoconcept demonstration (Hall -1)				BioMot demonstration (Hall -1)			
9:40-11:10	WS5 RoomT1	WS12 Room T2	WS3 Room T3	WS4 Room T4	WS9 Room T5	WS7 Room T7	WS8 Room T8	T1-W-S1 Room B	T2-W-S1 Room A	T3-W-S1 Room C	T4-W-S1 Room T3		T1-T-S5 Room B	T2-T-S5 Room A	T3-T-S5 Room C	T4-T-S5 Room T3	T1-F-S7 Room B	T2-F-S7 Room A	T3-F-S7 Room C	T4-F-S7 Room T3
11:10-11:30	Coffee Break Hall -1 and Hall 1																			
11:30-13:00	WS5 Room T1	WS12 Room T2	WS3 Room T3	WS4 Room T4	WS9 Room T5	WS7 Room T7	WS8 Room T8	T1-W-S2 Room B	T2-W-S2 Room A	T3-W-S2 Room D	T4-W-S2 Room C		T1-T-S6 Room B	T2-T-S6 Room A	T3-T-S6 Room D	T4-T-S6 Room C	T1-F-S8 Room B	T2-F-S8 Room A	T3-F-S8 Room D	T4-F-S8 Room C
13:00-14:00	Lunch Break Floor 0																			
14:00-14:45								Plenary - J. B. Troy Room A					Plenary - J. Wolpaw Room A				Plenary - H. Hirata Room A			
14:45- 15:00								Technaid demonstration (Hall -1)					Gogoa demonstration (Hall -1)							
15:00-16:30	WS1 RoomT1	WS2 Room T2	WS0 Room T3	WS4 Room T4	WS9 Room T5	WS6 Room T6	WS10 Room T7	WS13 Room T8	T1-W-S3 Room B	T2-W-S3 Room A	T3-W-S3 Room C	T4-W-S3 Room T3	S7 Room D	Plenary - J. C. Rothwell Room A			T1-F-S9 Room B	T2-F-S9 Room A	T3-F-S9 Room T3	T4-F-S9 Room C
16:30-17:00	Coffee Break Hall -1 and Hall 1													Poster session & Coffee Break Hall -1 and Hall 1			Coffee Break Hall -1 and Hall 1			
17:00-18:-30	WS1 RoomT1	WS2 Room T2	WS0 Room T3	WS4 Room T4	WS9 Room T5	WS6 Room T6	WS10 Room T7	WS13 Room T8	T1-W-S4 Room B	T2-W-S4 Room A	T3-W-S4 Room C	T4-W-S4 Room T3		Plenary - X. Navarro Room A			T1-F-S10 Room B		T2-F-S10 Room A	
18:30-20:00								Segovia Tour												
20:00	Opening Reception Parador de La Granja													Conference Banquet Glass Museum						

GENERAL CONFERENCE INFORMATION

Conference venue:

Centro de Congresos y Convenciones Guardia de Corps

C/ Alameda, 2. 40100 – La Granja de San Ildefonso (SEGOVIA)

All conference sessions will take place in this location. The opening reception and the conference banquet will be held offsite. For further details on these social events, please visit page 11.

Getting there:

The **fly-in airport is Adolfo Suarez Madrid Barajas Airport**. From the airport you will need to go:

Route 1– To Madrid Chamartin train station (**recommended option**). Chamartin station can be reached by metro (line 10), by train (if you landed in Terminal 4) or by taxi (flat fare, 30 EUR).

OR

Route 2– To Madrid Moncloa bus station (if you plan to take the bus to Segovia). You can take the metro (line 3) or a taxi (flat fare, 30 EUR).

If you arrived in Madrid Chamartin train station from the airport (Recommended option) – Route 1

Take a high-speed train (25 minutes) to Segovia train station (called Segovia Av. or Segovia Guiomar). To check the schedule and timetables please visit Renfe website. It is recommended to book in advance.

Then, transportation by shuttle bus will be provided to 'Parador de La Granja' on the first day and last day of the conference (if you are travelling any other day, please take a taxi to 'Parador de La Granja'). Timetable of the shuttles will be the following:

October 18: Segovia train station -> 'Parador de La Granja': 10am, 12pm, 2pm, 4pm, 6pm, 8pm, 10pm

October 21: 'Parador de La Granja' -> Segovia train station -> 8am, 10am, 12pm, 1pm, 3pm, 5pm, 7pm
These buses will have signs to be easily recognized. They are free and you do not need to book a place before.

If you arrived in Madrid Moncloa bus station from the airport – Route 2

Take a public bus from to Segovia (and back). They take around 75 minutes to Segovia and arrive at Segovia bus station where it is possible to take another bus to La Granja de San Ildefonso. They depart every 45 minutes approximately.

The bus company is the same for both trips. Please visit La Sepulvedana website to check the schedule and timetables.

From Segovia to La Granja de San Ildefonso (conference venue)

If you are in Segovia by any other means you can take a taxi to the conference venue (it will take around 15 minutes and will cost around 20€) OR a public bus to La Granja de San Ildefonso.

The bus company is called La Sepulvedana. Please visit the website to check the schedule and timetables.

Registration fees:

ICNR registration fees include access to all sessions including full access to activities in the International Symposium on Wearable Robotics. Registration also includes daily coffee breaks, lunches, the Opening Reception and the Gala Dinner.

Additional tickets:

Tickets can be purchased separately for your guests for the Opening Reception, and Gala Dinner. These additional tickets can be purchased from the staff at ICNR's Registration Desk.

Name Badges:

Your name badge is your admission ticket to the conference sessions and coffee breaks. Please wear it at all times. For the meals, opening reception and gala dinner you will find a ticket inside your badge. At the end of the Conference we ask that you recycle your name badge leaving it at the Registration Desk.

Registration and Information Desk Hours

If you need assistance during the Conference, please visit the Registration Desk.
The ICNR Registration and Information Desk, located in Floor 1, will be open during the following dates and times:

Tuesday, October 18 08:00 – 18:00
Wednesday, October 19 08:00 – 18:00
Thursday, October 20 08:00 – 18:00
Friday, October 21 08:00 – 18:00

Conference Proceedings:

For a complete copy of the Proceedings, digital copies can be downloaded from the Springer website with your personal code (see page 2).

This code will be valid as of October, 16th for 1 month.

When the ebooks are available you need to do the following steps to get access to the ebooks
1) an account on http://link.springer.com
2) activate the token
3) have access to the ebook

Poster Information

There will be one Poster Session during the Conference. Poster should be printed considering the recommended poster size: 70 (width) x 90 (height) cm. Authors are free to create their own poster design, there are no particular style requirements.

It will be held on Thursday, October 20 from 16:00 to 17:30. Poster presenters must set-up and remove their posters during the following times:

Set-up: Thursday, October 20, between 08:30 and 16:00
Remove: Thursday, October 20, between 17:30 and 19:00

Fixation material will be provided on site. Information on Poster Authors, Poster Numbers and Poster Titles begins on page 45.

Staff

ICNR2016 staff can be identified by t-shirts with the logo. Feel free to ask anyone of our staff for assistance. For immediate assistance please visit us at the Registration Desk.

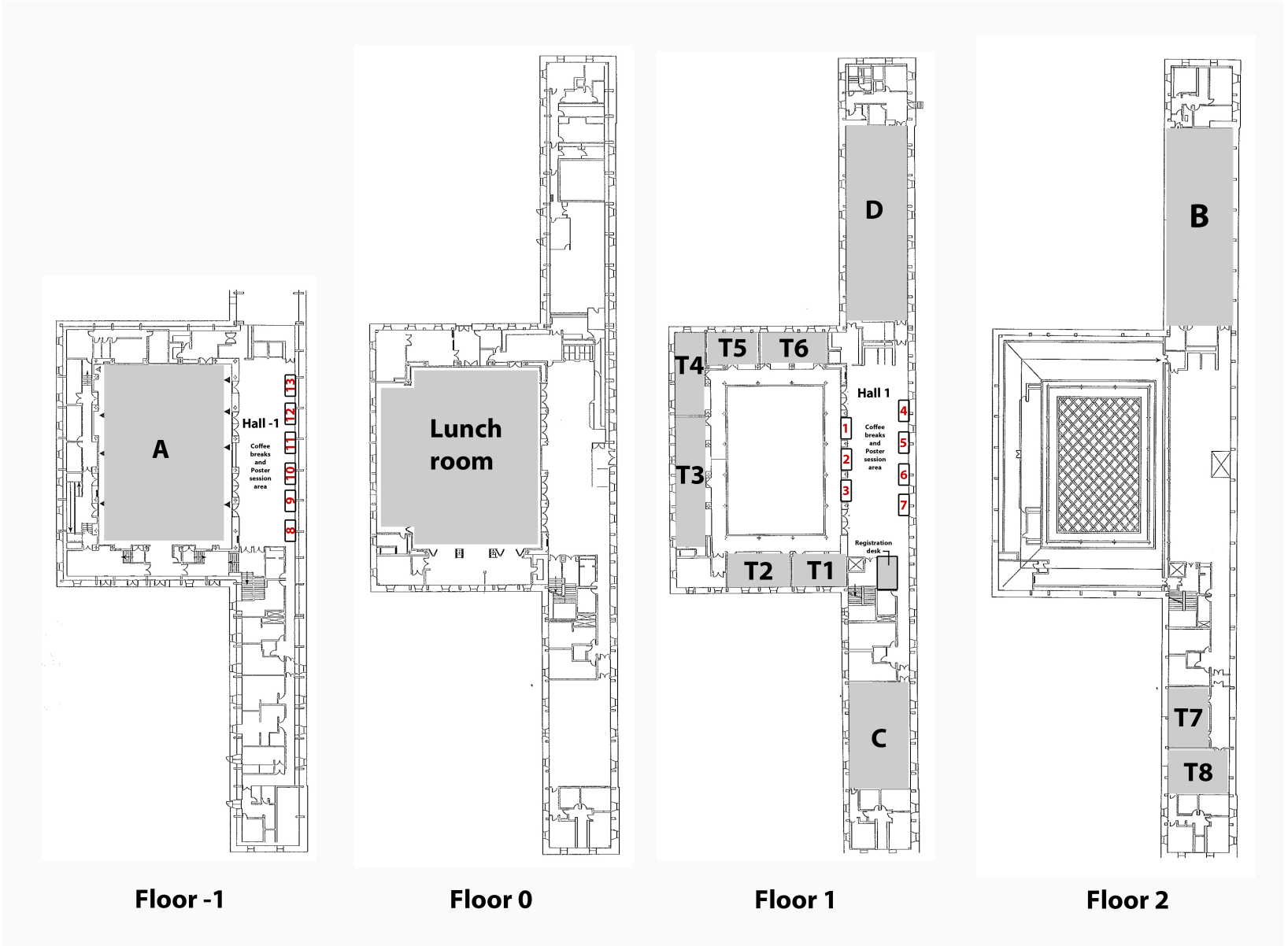
Internet Services

ICNR2016 is providing internet access as part of the 2016 conference registration. The wireless code for the duration of the conference is

Network name: parador
Password: A123450116

If you require assistance, please visit the registration desk.

FLOOR PLANS


A
Hall -1
Coffee breaks and Poster session area
13
12
11
10
9
8
Lunch room
D
T4
T5
T6
Hall 1
1
2
3
4
5
6
7
T3
Registration desk
T2
T1
C
B
T7
T8
Floor -1
Floor 0
Floor 1
Floor 2

CONFERENCE COMMITTEES

Conference Chairs:

José L. Pons, Cajal Institute, CSIC, Spain
José M. Azorín, Miguel Hernández University of Elche, Spain

Steering Committee:

Metin Akay, University of Houston, USA
José L. Pons, Cajal Institute, CSIC, Spain
Paolo Bonato, Spaulding Hospital Boston, USA
José Carmena, University of California, USA
Dario Farina, Imperial College, UK
Silvestro Micera, SSUP Sant'Anna, Italy

Scientific Program Committee

Chairs:

T.W. Berger, University of Southern California, USA
Eric Perreault, Northwestern University/Rehabilitation Institute of Chicago, USA
Marco Santello, Arizona State University, USA

Sunil K. Agrawal, Columbia University, USA
Fady SK. Alnajjar, RIKEN, Japan
Ole K. Andersen, Aalborg Univerity, Denmark
Joan Aranda, Institute for Bioengineering of Catalonia, UPC, Spain
Juan M. Belda, Biomechanical Institute of Valencia, Spain
Dolores Blanco, Robotics Lab, Universidad Carlos III de Madrid, Spain
Fernando Brunetti, Universidad Católica "Nuestra Señora de Asunción", Paraguay
Santiago Canals, Instituto de Neurociencias, CSIC- UMH, Spain
Alicia Casals, Institute for Bioengineering of Catalonia, UPC, Spain
Fernando de Castro, Cajal Institute, CSIC
José L. Contreras-Vidal, University of Houston, USA
Javier Cudeiro, Neurociencia y Control Motor, U. da Coruña, Spain
Kim Dremstrup, Aalborg University, Denmark
Anselmo Frizera, Universidade Federal do Espiritu Santo, Brazil
Bernhard Graimann, Otto Bock Healthcare GmbH, Germany
David Guiraud, LIRM/UM2, Montpellier, France
Oscar Herreras, Cajal Institute, Spain
Ales Holobar, University of Maribor, Slovenia
Antoni Ivorra, Univesitat Pompeu Fabra, Spain
Juan José Garrido, Cajal Institute, Spain
Winnie Jensen, Aalborg University, Denmark
Thierry Keller, Tecnalia Research & Innovation, Spain
Keiichi Kitajo, RIKEN Brain Science, Japan
Herman van der Kooij, University of Twente, The Netherlands
Dirk Lefeber, Vrije Universiteir Brussel, Belgium
Rui Loureiro, University College London, UK

Luis Martinez Otero, Instituto de Neurociencias, CSIC-UMH, Spain
Donatella Mattia, Fondazione Santa Lucia, Italy
Katja Mombaur, Ruprecht-Karls-Universität Heidelberg, Germany
Natalie Mrachacz-Kersting, Aalborg University, Denmark
Gregor Novak, European Commision
Monica Reggiani, University of Padova, Italy
Mavi Sánchez-Vives, Institució Catalana de Recerca I Estudis Avançats, Spain
Massimo Sartori, Universitätsmedizin Göttingen, Germany
Shingo Shimoda, RIKEN, Japan
Rogelio Soto, Tecnológico de Monterrey, Mexico
Thomas Stieglitz, Albert-Ludwigs Universität Freiburg, Germany
Toshiaki Tsuji, Saitama University, Japan
Aiko K. Thompson, Medical University of South California, USA
Jan Veneman, Tecnalia Research & Innovation, Spain
Conor Walsh, Wyss Institute at Harvard University, USA
Wenwei Yu, Chiba University, Japan

Clinical Program Committee

Chairs:

Marco Molinari, Fondazione Santa Lucia, Rome, Italy
Enrique Viosca, La Fe Hospital, Valencia, Spain

Jose M. Climent, Alicante Hospital, Spain
Volker Dietz, Balgrist University Hospital, Zurich, Switzerland
Alberto Esquenazi, MossRehab, USA
Gerard E. Francisco, University of Texas Health Science Center at Houston, USA
Angel Gil, Hospital Nacional de Parapléjicos de Toledo, Spain
Noriaki Hattori, Morinomiya Hospital, Japan
Juan C. Miangolarra, LAMBECOM Group, Rey Juan Carlos University, Spain
Álvaro Pascual-Leone, Harvard Medical School, USA
Federico Posteraro, Auxilium Vitae Volterra, Italy
John C. Rothwell, Institute of Neurology University College London, UK
Marianno Serrao, University 'La Sapienza' Rome, Italy
Julian S. Taylor, Hospital Nacional de Parapléjicos de Toledo, Spain
Jose M. Tormos, Guttmann Institute Barcelona, Spain
Jonathan Wolpaw, Wadsworth center, University of New York State, USA
Ulf Ziemann, Dept. Neurology & Stroke, Univ. Hospital Tubingen,

Industrial Program Committee

Chair:

Freygardur Thorsteinsson, Ossur, Iceland

Jordi Cortés, Bionics Iberica, Spain
Christoph Guger, gTec, Graz, Austria
Ana Maiques, Neuroelectrics, Barcelona, Spain
Carlos Prieto, Technaid, Spain
Javier Roa, Technaid, Spain
Lydia Timm, Brain Products, Germany

Organizing Program Committee

José L. Pons, Cajal Institute, CSIC, Spain
Jose González, Cajal Institute, Spain
Jaime Ibáñez, Cajal Institute, Spain
Luis Barrios, Cajal Institute, Spain
Magdo Bortole, Cajal Institute, Spain
Juan C. Moreno, Cajal Institute, Spain
Diego Torricellli, Cajal Institute, Spain
Eduardo Iáñez, Miguel Hernández University of Elche, Spain
Andrés Úbeda, Miguel Hernández University of Elche, Spain

SPECIAL EVENTS & MEETINGS

Opening Reception
Tuesday, October 18
7.30pm
Location: Parador de La Granja

The opening reception will be held at the Parador de La Granja. This event is included in your Registration fee. If you plan to bring an accompanying guest to the reception, you can purchase an additional ticket at the registration desk for 30€. If you require assistance getting to the venue, please come and see us at the registration desk.
Dress Code: Casual

Conference Banquet
Thursday, October 20
8pm
Location: Glass Museum
'Real Fábrica de Cristales de la Granja'

This dinner is included in your registration. If you plan to bring an accompanying guest to the dinner, you can purchase an additional ticket at the registration desk for 70€.
Dress Code: Casual

CONFERENCE EXCURSION

Segovia Tour

Segovia is a city full of history, with its origins dating back to Celtiberian tribes. From the 16th century, Segovia's skyline has been compared to a ship made of stone.

World Heritage Route: It is, perhaps, the most representative route of the city. It takes the visitor along the main streets of the ancient city. The route starts at the feet of the Aqueduct, with a walk along Calle Real - the main street of the city -. The first stop is the sightseeing point of La Canaleja (also close to the surprising Casa de los Picos). Leaving behind the Medina del Campo square and the Romanesque church of San Martin, we will reach the Corpus Square with the former Main Synagogue, converted nowadays into the Catholic Church of Corpus Christi. Later on, we will visit the Main Square and the Cathedral. The guide ends with an explanation of the Alcázar.

AQUEDUCT OF SEGOVIA: Located in Azoguejo Square, this unique and magnificent Roman construction from the 2nd century was aimed to carry the water from the mountains to the city. It is built with huge blocks of granite stone from Guadarrama Mountains, and there is no concrete or mortar between the stones. Its equilibrium is maintained by using an ingenious weight balance. Water ran on the channel at its top, and crossed the city underground until it reached the Alcázar. Its original total length, from its origin in the Sierra de Guadarrama Mountains, is 14.965 m. Its highest point is 29 meters and total number of arches of the construction is 166. This place is a protected National Monument since 1884 and World Heritage Monument since 1985.

CASA DE LOS PICOS: This ancient palace was built in the 15th century decorated with diamond points and with a Renaissance style.

SAINT MARTIN CHURCH: The magnificent temple is an actual sample of Castilian Romanesque art from the 12th century.

CATHEDRAL: Following the late Gothic Style, the construction begun in 1525 under the direction of the architect Rodrigo Gil de Hontañón and it was finished in 1768. It has a three-nave floor with a transept covered by a dome. Facing north, we may find the Door of San Frutos, built in honour of the patron saint of the city. The grandeur and harmony on dimensions defines the inside spaces, with its beautiful glass stained windows from the 14th century and 18 chapels on the inside, decorated with important paintings and sculptures.

ALCÁZAR: Its silhouette appears as an imaginary ship over the confluence of the rivers Eresma and Clamores. The Castle, built on the remains of a Roman fortress, was successively transformed. A deep moat with a drawbridge gives us entrance to a fortress situated in a privileged place. Inside the monument, we must pay attention to the Ajimeces Room, the Chimney Room, The Throne Room -with an outstanding mudéjar ceiling-, The Pineapples Room, and the Kings Chamber containing an extraordinary coffered ceiling made of golden hexagons and rhomboids, and a curious frieze displaying 52 sitting images of the Kings and Queens of Asturias, León and Castilla. The Alcázar became Royal College of Artillery in 1764.

PRE-CONFERENCE WORKSHOPS – OCT 18

For updated information about the workshops, including the final program, please visit regularly the website.

WS0. Present and future of neural stimulation techniques for neural assessment and rehabilitation

Organizers: J. Ibáñez and S. Piazza, Cajal Institute, Spanish National Research Council, Spain.

Abstract:

Several methods have been proposed so far for the stimulation of neural structures, targeting the CNS (tDCS, TMS, SCS) or the PNS (Peripheral afferent nerve stimulation, cutaneous stimulation, TENS...). Improved technologies and more effective protocols are constantly being presented, pushing the limits of innovation in this field. These advances allow a better understanding of the nervous system functions and offer new methods for generating and driving CNS plasticity, with huge potential for medicine and rehabilitation. In this workshop, experts from the field will provide a general perspective of their research areas and discuss the current state of the art and future of these technologies.

Speakers:

- J. Gómez-Soriano, National Paraplegic Hospital of Toledo, Spain
- Dr. Rafal Nowak, Neuroelectrics, USA/Spain
- A. Oliviero, Neural Repair, National Paraplegic Hospital of Toledo, Spain
- H. Kumru, Guttmann Institut, Spain
- Winnie Jensen, Department of Health Science and Technology, Aalborg University
- Ole Kæseler Andersen, Dep. of Health Science and Technology, Aalborg University

TIME	TOPIC	SPEAKER	TITLE
15:00-15:30	Surface ES	W. Jensen	Surface electrical stimulation in neurorehabilitation: application in Phantom Limb Pain
15:30-16:00	Surface ES	O. K. Andersen	Nerve fibre diameter selectivity of surface electrical stimulation. Relevance for research and neuromodulation
16:00-16:30	Afferent Stimulation	J. Gómez-Soriano	Cutaneomuscular spinal reflex activity as a biomarker of motor dysfunction and neurorehabilitation after incomplete spinal cord injury
16:30-17:00	COFFEE BREAK		
17:00-17:30	rTMS	H. Kumru	Repetitive transcraneal magnetic stimulation in the field of rehabilitation
17:30-18:00	Static Magnetic Field Stimulation	A. Oliviero	Static Magnetic Field stimulation as a future treatment in neurology and neurorehabilitation
18:00-18:30	TDCS	R.Nowak	tDCS: present and future

WS1. Stimulating recovering from neurological disorders using invasive neural interfaces

Organizers: Lee Miller, Northwestern University, Chicago, USA

Abstract:

Brain Machine Interfaces (BMIs) hold great promise for improving the lives of patients with motor disabilities caused by stroke or spinal cord injury (SCI). Emphasis has been placed primarily on restoration of function, including computer cursors, robotic limbs, and even electrically activated muscles controlled using signals obtained directly from the brain. However, neurological injury increases plasticity within the CNS, opening a short-lasting window for therapeutic intervention. There is mounting evidence that electrical stimulation, either centrally or in the periphery, if appropriately timed with respect to motor intent, can induce adaptive plastic changes and generate accelerated functional recovery from motor disorders. This session will examine a range of these stimulus-driven therapeutic approaches to recovery from stroke and spinal cord injury.

Program:

15:00 – 15:30: Jeff Kleim
School of Biological & Health Systems Engineering, Arizona State University
Cortical Surface Stimulation to Enhance Motor Recovery After Stroke

15:30 – 16:00: Yukio Nishimura
Department of Neuroscience Graduate School of Medicine, Kyoto University
Rewiring of a damaged neural pathway induces targeted reorganization of an extensive cortical area

16:00 – 16:30: Seth Hays
Department of Bioengineering, Jonsson School of Engineering and Computer Science, University of Texas at Dallas
Enhancing Rehabilitation with Vagus Nerve Stimulation

16:30 – 17:00: Coffee Break

17:00 – 17:30: Lee Miller
Physiology Department, Feinberg School of Medicine, Northwestern University
Cortically-controlled FES to restore motor function following spinal cord injury

17:30 – 18:00: Tomislav Milekovic
Center for Neuroprosthetics and Brain Mind Institute, Swiss Federal Institute of Technology
Neuroprosthetic technologies to improve motor recovery after spinal cord injury

18:00 – 18:30: General Discussion

WS2. Transcranial current stimulation (tDCS) in neurorehabilitation: from research to clinical translation

Organizers: Ana Maiques, Neuroelectrics, Spain

Abstract:

In the last decade there has been a tremendous increase in tDCS research, delivering exciting prospects for clinical applications in several fields. In this session, experts in the field will discuss the state of the art of tDCS research in neurorehabiliation, with a view on the emerging clinical applications of this novel technology. During the coffee break there will be a hands on tDCS training session highlighting new technologies for multichannel tDCS, combination with EEG and home use.

Speakers:

Alvaro Pascual Leone (Director of the Berenson-Allen Center for Noninvasive Brain Stimulation at Beth Israel Deaconess Medical Center.)
The state of the art of tDCS: what can we expect in the near future?

Ana Maiques (CEO, Neuroelectrics) & Rafal Nowak (PhD, Neuroelectrics)
The new generation of tDCS technologies

Dylan Edwards (Director, Non-Invasive Brain Stimulation and Human Motor Control Laboratory, Burke Rehabilitation Hospital)
tDCS in neurorehabilitation

Friedhelm Hummel (Defitech Chair of Clinical Neuroengineering, Brain Mind Institute, Centre of Neuroprosthetics (CNP), Swiss Federal Institute of Technology (EPFL), Campus Biotech, Geneva)
Towards patient-tailored tDCS-based interventions for neurorehabilitation

Surjo Soekadar (University Hospital of Tübingen Head, Applied Neurotechnology Lab)
The synergies of tDCS, BCI and neurorehabilitation

WS3. Neuromuscular mechanisms in motor control

Organizers: Andrés Úbeda and Eduardo Iáñez, BMI Systems Lab, Miguel Hernández University of Elche, Spain

Abstract:

Motor control is the process in which humans use their brain to activate and coordinate the muscles and limbs involved in the performance of a motor skill. The study of how this motor control is achieved has become increasingly useful in neurorehabilitation therapies where motor learning is a key factor in the recovery of motor function. This workshop provides an overview of current studies on neuromuscular mechanisms in charge of motor control and coordination showing recent advances on various aspects: from the cortical involvement during motor execution to the role of synergistic control in muscle activation.

Speakers:

- Jose Luis Contreras-Vidal, Brain-Machine Interface Systems Team, University of Houston, Houston (United States)
- Andrés Úbeda, Brain-Machine Interface Systems Lab, Miguel Hernández University, Elche (Spain)
- Diego Torricelli, Neural Rehabilitation Group, Instituto Cajal, CSIC, Madrid (Spain)
- Massimo Sartori, Institute of Neurorehabilitation Systems, University Medical Center, Göttingen (Germany)

WS4. Experiences and advances in technologies for rehabilitation and functional compensation in Iberoamerica, with a focus on Wearable Robotics

Organizers: Prof. José M. Azorín, Miguel Hernandez University of Elche, Spain, Coordinator CYTED-REASISTE-NETWORK, Prof. José L. Pons, Neural Rehabilitation Group, Cajal Institute, Spanish National Research Council, Prof. Eduardo Caicedo B., University of the Valley, Colombia.

Abstract:

In Latin America people with a neurological injury are a very disadvantaged group that has not devoted coordinated effort by clinical centres, research centres, universities and companies. This workshop is expected to be a large working forum to facilitate cooperation and exchange of knowledge among participants working in rehabilitation and assistance of persons with neurological injuries. Special attention is paid to Wearable Robotics. In the workshop the state of the art in Iberoamerica of rehabilitation and assistance of patients with neurological injuries will be revised as well as the potential clinical applications of novel technologies.

Goals:

Establish a broad forum working to enable and facilitate cooperation and exchange of knowledge between Latin American actors working in the field of rehabilitation and care of patients with neurological injury.

Program:

Time	Conference
9:40 – 9:50	Towards a Wearable Robot for Lower Limb Rehabilitation through Human Motion Intention. Denis Delisle Rodriguez, Ana Cecilia Villa Parra, Alberto López-Delis, Anselmo Frizera Neto, Eduardo Rocon and Teodiano Bastos.
9:50– 10:05	Velocity dependent spasticity detection for Active Exoskeleton based therapies. Rafael Mendoza, Rogelio Soto and Jose Luis Pons.
10:05 – 10:20	Evaluating cognitive mechanisms during walking from EEG signals. Eduardo Iáñez, Álvaro Costa, Andrés Úbeda, Enrique Hortal, Marisol Rodríguez-Ugarte and Jose M. Azorin.
10:20 – 10:35	Effects of the use of functional electro-stimulation (FES) on the physiological cost, speed and capacity of gait after stroke. Silvana Mercante, Edgardo Cersósimo, Carolina Letelier and Silvina Cacciavillani.
10:35 – 10:50	Bioinspired Hip Exoskeleton for Enhanced Physical Interaction. Diego Casas, Marcela Gonzalez Rubio, Miguel Montoya, Wilson Sierra, Luis Rodriguez,

	Eduardo Rocon and Carlos A. Cifuentes
10:50 – 11:05	Inclusive Approach for Developing a Robotic Vehicle for Disabled Children. H. Fernández, G. Mercado, V. González and F. Brunetti.
11:05 – 11:30	Coffee Break Hall 1
11:30 – 11:45	Pseudo-online Multimodal Interface Based on Movement Prediction for Lower Limbs Rehabilitation Thomaz Botelho, Douglas Soprani, Camila Rodrigues, Paula Rodrigues, Paula Schneider, Andre Ferreira and Anselmo Frizera.
11:45 – 12:00	Comprehensive Environmental Intervention for Cerebral Palsy based on the International Classification of Functioning Disability and Health. Patricio Barria, Veronica Schiariti, Asterio Andrade, Antonia Bandera, Heriberto Henriquez and Andre Moris.
12:00 – 12:15	Defining therapeutic scenarios using robots for children with Cerebral Palsy. Jaime Alberto Buitrago and Eduardo Francisco Caicedo Bravo.
12:15 – 12:30	An approach to Phase Model for Steady State Visually Evoked Potentials. Jaiber Evelio Cardona Aristizabal, Eduardo Caicedo, Wilfredo Alfonso, José Del R Millán and Ricardo Chavarriaga.
12:30 – 12:45	Serious Game for Post-Stroke Upper Limb Rehabilitation. Nicolas Jacobo Valencia Jimenez, Vivianne F Cardoso, Anselmo Frizera Neto and Teodiano Bastos.
12:45 – 13:00	Wearable Robotic Walker for Gait Rehabilitation and Assistance in Patients with Cerebral Palsy. Carlos A. Cifuentes, Cristina Bayon, Sergio Lerma, Anselmo Frizera, Luis Rodriguez and Eduardo Rocon.
13:00 – 15:00	Lunch Break Floor 0
15:00 – 15:20	Experiences in Development and Application of Simplified Technologies for Rehabilitation and Gait Analisys. Fernando Salvucci, Ricardo Garbayo, Carolina Fernández Biscay and Rafael Kohanoff.
15:20 – 15.40	Quasi-static tests on a low cost polymer optical fiber curvature sensor. Arnaldo G. Leal Junior, Lucas G. Webster, Anselmo Frizera-Neto and Maria José Pontes.
15:40 – 16:60	Proposal for clinical validation of lower limb robotic exoskeleton in patients with incomplete spinal cord injury. Soraya Perez Nombela, Antonio J. Del-Ama, Angel Gil-Agudo, Mónica Alcobendas-Maestro, Fernando López-Díaz, Jesús Benito-Penalva, José L. Pons and Juan C. Moreno.
16:30 – 17:00	Coffee Break Hall 1
17:00 – 17:15	IBERDISCAP 2017, Presentation. José Luis Pons, Luis E. Rodriguez Cheu
17:15 – 17:30	Tribute to Doctor Ramón Ceres. Recognition Act to former members of the Board of AITADIS José Luis Pons

WS5. BCIs for stroke rehabilitation, for assessment of locked-in and DOC patients

Organizers: Arnau Espinosa, Guger Technologies OG

Abstract:

Lately, BCI systems become increasingly used in the context of stroke rehabilitation. Many BCI systems are based on motor imagery activity recorded from the sensorimotor cortex, which is translated into continuous control signals for rehabilitation devices. The workshop will review current stroke rehabilitation using BCI technology and will provide insight into technology, experimental setups, results and outcomes of patient studies. Some patients diagnosed as vegetative are reclassified as (at least) minimally conscious when assessed by expert teams. A further subset of potentially communicative non-responsive patients might be undetectable through standard clinical testing. Other patients might have transient periods of relative wakefulness, but remain unaware of their surroundings. The workshop will provide an overview of BCI technology to identify non-responsive patients that might be able to communicate and use the technology as an assessment tool.

Goals:

General principles of BCI for stroke rehabilitation, coma assessment and communication will be explained, so the audience will get an inside in the topic. Further participants will be able to understand the target patient group. Participants will learn about state-of-the art in BCI stroke rehabilitation, coma assessment and communication.

Half Day Workshop Schedule:

Introduction to major methodological approach of BCI for stroke rehabilitation, coma assessment and communication (30 min); results of ongoing measurements (30 min); practical session with a live demonstration of stroke rehabilitation system using BCI technology (45 min); practical session with a live demonstration of an assessment system for DOC patients using BCI technology (45 min).

Knowledge that will be obtained:

Participants will learn about current technology for stroke rehabilitation, coma assessment and communication will be explained. Participants will also be able to understand the target patient group. Finally, participants will learn about state-of-the art in BCI stroke rehabilitation.

Program:

9:40 to 11:10 - talk/presentation: BCIs for stroke rehabilitation, for assessment of locked-in and DOC patients (A. Espinosa)
11:30 to 13:00 - hands on session using: Recoverix, Mindbeagle, Intendix

WS6. Brain-machine interface systems for motor rehabilitation

Organizers: José Carmena, University of California, Berkeley, USA and Ander Ramos, University of Tuebingen, Germany.

Abstract:

Brain Recently neural interfaces have ben proposed as a means for motor rehabilitation of severely paralyzed patients who cannot benefit for an alternative therapy. This workshop will report on current advances in the use of brain-machine interface (BMI) systems for motor rehabilitation. This field aims to use closed-loop BMI technology as a means of inducing functional plasticity to circumvent the lesion in the brain and facilitate functional motor recovery. The workshop will cover different aspects of BMI systems that are relevant to motor rehabilitation, including neurotechnology, experimental work in animal models, as well as human clinical trials.

Speakers:

Introductory remarks (Ander Ramos and Jose Carmena)

Prof. Thomas Stieglitz (IMTEK-Freiburg)
Development, prototyping, fabrication and testing individualized long-term safe electrode arrays

Prof. Silvestro Micera (EPFL)
Neuro-controlled artificial limbs

Prof. Leigh Hochberg (Brown)
Control signals from motor cortical activity in humans with tetraplegia

Prof. Niels Birbaumer (Tuebingen)
Brain-computer interfaces as communication devices for ALS patients

WS7. Robotic systems for training and assistance of walking

Organizers: Jan F. Veneman, Health – Rehabilitation Robotics, Tecnalia Research and Innovation; Danijela Ristić-Durrant, Institute of Automation, University of Bremen, Germany; Carlos Rodriguez Guerrero, Robotics and Multibody Mechanics group, Vrije Universiteit Brussel, Belgium; Edwin van Asseldonk, Department of biomechanical Engineering, MIRA, University of Twente, the Netherlands)

Abstract:

The development of robotic devices for training and assistance of walking has been gaining intensity in recent years. This development has been driven by the expectation that robot-assisted gait rehabilitation reduces the physical load to the therapist during the training, increases the training intensity, allows a quantitative assessment of the patient's performance and improves the patient's walking ability. Also, there are expected advantages outside of the rehabilitation field, such as the support of the elderly in performing activities of daily living independently at their own homes, and the support of workers in specific working conditions. This increased research and development has led to new challenges in the design and control of robotic systems for walking assistance and rehabilitation. These robotic systems are no longer simple devices to support basic movements, but rather advanced robotic systems that enable for example, training of natural walking including balance training and building synergy with motion capabilities of the human user. In this workshop, different aspects of current research and development, the challenges of the field, and limiting factors in innovative robotic solutions for walking rehabilitation and assistance will be discussed. The presentations will highlight the

issues related to the design and control of innovative robotic systems around the following topics:
- Human cooperative control strategies in robotic systems for training and assistance of walking
- Training and assistance of natural-like walking including balance (training protocols and development of control strategies)
- Actuator designs for human cooperative behaviour in robotic systems for training and assistance of walking
- New conceptual approaches in robotic systems for training and assistance of walking

Goals:

This workshop aims at bringing together researchers from the robotics field of walking rehabilitation and assistance, experts in clinical movement analysis and rehabilitation, biomechanics and human motor control to discuss different aspects of current research and development, the challenges of the field, and limiting factors in innovative robotic solutions for walking rehabilitation and assistance. The organizers explicitly aim to encourage discussion among senior and junior researchers, on these topics. As continuity of the successful previous edition of this workshop held at ICORR 2015, the organizers selected leading speakers in the fields related to the design and applications of lower-limb robotic systems for rehabilitation and assistance, from physiology to safety and control.

Speakers:

- Nicola Vitiello (Scuola Superiore Sant'Anna)
- Zlatko Matjačić (University Rehabilitation Institute Ljubljana)
- Yu Haoyong (National University of Singapore)
- Thomas Sugar (Arizona State University)
- Dirk Lefeber (Vrije Universiteit Brussel)
- Conor Walsh (Harvard University)

Beside the invited speakers, two organizers will give presentations:

- Edwin van Asseldonk
- Danijela Ristić-Durrant

WS8. Advanced acquisition and processing of electrophysiological activity in the central and peripheral nervous systems

Organizers: J. Ibáñez and J. E. González-Vargas, Cajal Institute, Spanish National Research Council, Spain

Abstract:

During the past years, significant advances have been made in the development of technological solutions that allow incredibly precise means of recording and characterising the activity in the CNS and PNS. The suitability of these different solutions for diagnostic and therapeutic applications has to be precisely considered in many different lines within the neurorehabilitation field. This workshop will give a highly technical overview the current research lines involving techniques such as LFPs, multi-channel, high-density neural recordings, EEG, high-density EMG and MEG. Speakers will highlight the main opportunities and technological challenges related to the acquisition and processing of these high-dimensional recordings.

Speakers:

- Óscar Herreras, Instituto Cajal, Spanish National Research Council
- Jose Carmena, University of California, Berkeley, USA
- Pablo Cuesta, Centro de Tecnologías Biomédicas, Universidad Politécnica de Madrid, Spain
- M-V. Sáchez-Vives, ICREA - IDIBAPS
- Ales Holobar, University of Maribor, Slovenia

TIME	TOPIC	SPEAKER	TITLE
09:40-10:10	Neuroprosthetics control	Ivan Vujaklija	Prospects of Neurorehabilitation Technologies Based on Robust Decoding of the Neural Drive to Muscles following Targeted Muscle Reinnervation
10:10-10:40	EMG decomposition	Ales Holobar	Analysis of correlation between the neural drive to muscles and multichannel surface EMG amplitudes
10:40-11:10	EEG	M-V. Sáchez-Vives	Electrical modulation of cerebral cortex activity: mechanisms and applications
11:10-11:30	COFFEE BREAK		
11:30-12:00	Local Field Potentials	Oscar Herreras	New uses of LFPs: Pathway-specific threads obtained through spatial discrimination
12:00-12:30	MEG	Pablo Cuesta	Functional connectivity and Magnetoencephalography
12:30-13:00	Intracortical recording technologies	José Carmena	Large-scale recording and intervention in neural circuitry of learned behaviors

WS9. Inertial technology for Biomechanical Assessment, breaking paradigms.

Organizers: Centro Superior de Estudios Universitarios LaSalle and Technaid S.L

Abstract:

It is well known the motion capture systems based on cameras (photogrammetric technics) are reference in the biomechanical analysis field, despite its limitations and disadvantages, such as high computational costs, high start-up time or low portability. The cutting-edge inertial technology is showing excellent capabilities to become a revolutionary new reference in this field with several advantages.

Organized by Centro Superior de Estudios Universitarios LaSalle and the company Technaid S.L., this workshop is framed as a hands-on experience where the attenders will immerse in using the Tech-MCS, the inertial motion capture system developed by Technaid and designed for biomechanical analysis.

Thus, starting with the basics of this technology through some research studies, it will be evident how the versatility, portability and reliability of the inertial technology increase its potential to be applied in different areas of human biomechanics assessment.

1. Introduction to Inertial Technology.
A brief introduction to Inertial Technology fundaments will underlie the lecture about Inertial Motion Capture Systems applied to human biomechanics, as an objective measurement tool. During the lecture we will go in depth in the extent of these systems stocktaking the advantages and disadvantages in their application on biomechanics.

2. Presentation of Inertial Technology Reliability Validation Studies.
We will introduce the different Validation Studies carried out at the LaSalle's Biomechanics Laboratory. The most relevant study is about the comparison between Inertial Technology based Motion Capture System and current market referents as Optoelectronic Motion Capture Systems. Several data will be explained about the Inertial System validity during the evaluation of human biomechanics in different motion planes.

3. Movement Valuation During Musculoskeletal Pain. Pathologic Gait Study.
Experimentation will be prioritized. Attendees will have the opportunity to implement their recent knowledge about Inertial Motion Capture Systems by means of different exercises selected to strengthen the use of this technology with an easy and efficient approach, obtaining quick results. 3D angular measurements will be obtained in different human joints, as well as different Pathologic Gait Analysis will be carried out. In addition, attendees will have the opportunity to set out and solve any specific need about their studies in movement analysis.

4. Implementation in Neuro-Rehabilitation.
Central nervous system disorders usually come up with different motor disorders. In neuro-rehabilitation area, the improvement on the joints' motor control could be assisted by inertial systems in order to increase the cognitive impact of the movement, as well as to apply sensitive feedback techniques.

Physiotherapeutic procedures examples, for motor-control improvement, applying inertial technology will be introduced too.

WS10. The impact of technology on embodiment. Wearable Robots and Body representation

Organizers: M. Molinari and I. Pisotta

Abstract:

Our brain is very adaptive, and can map relevant artificial tools as an extension of the physical body. The relationship between the body and the external object is special when wearing tools. This is more true in patients with a reduction or loss of sensorimotor information due to injury and the use of wearable devices may influence recovery by interacting with the residual body capacities interfacing, directly or indirectly, with an altered sensorimotor systems. In the present workshop, we will focus on the neurobiological mechanisms of embodiment and how specificities of wearable robotic devices may influences body schema changes as well as devices usage and improve functionality. To induce changes on body perception has critical ethical issues, which will be also addressed.

Speakers:

- Marco Molinari. Introduction. 10 min - Marco Molinari. "The neurobiology of embodiment in health and disease" 20+10 minutes.
- Pisotta Iolanda. "To wear VS to use devices for motion assistance: Agency affect body representation" 20+10 minutes.
- Dario Farina. "Robotic devices in amputees and body representation" 20+10 minutes.
- Étienne Burdet. "To wear haptic devices for body representation changes" 20+10 minutes.
- Pim Haselager. "Wearables, agency and responsibility: On the ethics of wearable robotics" 20+10 minutes.
- Round Table: general discussion

WS11. Rehabilitation tomorrow: the role of advanced technologies

CANCELLED

Organizers: T. Keller, IISART

Speakers:

- Dr. Federico Posteraro (Director of Rehabilitation Department of AUSL 12 Viareggio). "Technologies in Rehabilitation - What do we know from basic research?"
- Dr. Ursula Costa (Clinical Applications Manager, Hocoma AG). "A perspective from practice - Why should technologies complement modern rehabilitation?"
- Dr. Thierry Keller (Head Rehabilitation Department at Tecnalia). "What do we expect in future rehabilitation?"
- Expert panel: question & answer with the experts, (20 minutes) - Round Table: general discussion

WS12. Towards a roadmap for Benchmarking in Wearable Robotics

Organizers: D. Torricelli, CSIC; J. Veneman, Tecnalia; and J. González, CSIC

Abstract:

The availability of standardized metrics and protocols to evaluate the effectiveness of wearable robotics technology is a crucial step in the research-to-market process. What "good" means in wearable robotics is still an open question, which involves multiple perspectives at technical, clinical and usability levels.

This workshop is to promote a face-to-face discussion between engineers, clinicians and users in identifying the most promising directions in this field. The workshop will result in a draft version of a "roadmap for benchmarking", which can be used by the community to guide future research and collaborative actions.

This workshop is a follow-up of previous workshops at WeRob2014, ICORR 2015, and WeRob2016. The workshop is supported by the recently created network on benchmarking, and by the European Projects Biomot and BALANCE.

Discussion:

In the first part of the workshop, the attendees will be divided in small discussion groups focused on the following features:

- Benchmarking physical and cognitive interaction between robot and user
- Benchmarking physiological and subjective impact of robotic therapy
- Benchmarking performance of industrial wearable robots
- Benchmarking safety

The discussion should result in concrete proposals on the following aspects*:
- Identifying the target motor functions (e.g. walking, reaching, grasping, etc…)
- Identifying the variables to be measured (e.g. interaction force, kinematics, etc…)
- Designing protocols for experimentation on real systems
- Identifying barriers and solutions for the replicability of protocols

In the second part of the workshop, each group will briefly report about the most relevant points discussed, in order trigger a more general discussion with the audience. Throughout the workshop, organizers will collect the main conclusion, and draft a first version of the roadmap, that will be made available to the attendees interested in receiving it.

*The groups will be supported with material to favor interactive and creative discussion (Post-it, markers, flip charts, published papers, etc…).

WS13. The IEEE Brain Initiative Workshop on Advanced NeuroTechnologies for NeuroRehabilitation

Organizers: M. Akay, University of Houston; José L. Pons, CSIC

Abstract:

The IEEE Workshop on Advanced NeuroTechnologies for Neurorehabilitation, sponsored by the IEEE Brain Initiative, will be held October, 18th, 2016, at the International Conference on Neurorehabilitation. We strongly encourage members of both the Neuroscience and Engineering Communities to attend this highly multidisciplinary workshop.

The workshop will highlight recent technological advances by focusing on advanced technologies that monitor and control brain activities to treat neurological diseases, including Alzheimer's, Epilepsy, Depression, etc., from the molecular to systemic levels and with a special focus on neural prosthesis that have signicantly restored and enhanced the impaired sensory functions, cognitive functionas and motor systems.

Invited talks will be presented by internationally well respected researchers. This workshop will provide a unique interactive platform to exchange of ideas in the areas of BRAIN initiatives with leading researchers and medical and industry professionals.

Program:

SIlvestro Micera (3.00-3.30 pm)
Ted Berger (3:30-400.pm)
Jose L. Pons (4.00-4.30)
Erik Perreault (5.00-5.30 pm)
Dario Farina (5.30-6.00 pm)
Winnie Jensen (6.00-6.30 pm)

ICNR 2016 PROGRAM – OCT 19-21

Wednesday, 19th

	Wednesday 19				
8:30-9:20	Plenary - A. Pascual-Leone				
9:20-9:40	Neuroelectrics demonstration				
9:40-11:10	T1-W-S1 New approaches for targeted neuromodulation of the motor nervous system (I)	T2-W-S1 Biomechanics & movement analysis in rehabilitation (I)	T3-W-S1 Wearable human-robot interface for upper limb function recovering	T4-W-S1 Neural siganl processing of the pathological brain	
11:10-11:30	Coffee break				
11:30-13:00	T1-W-S2 New approaches for targeted neuromodulation of the motor nervous system (II)	T2-W-S2 Biomechanics & movement analysis in rehabilitation (II)	T3-W-S2 Soft wearable robotics: potential for neurorehabilitation	T4-W-S2 Data mining and physiological signals	
13:00-14:00	Lunch break				
14:00-14:45	Plenary - J. B. Troy				
14:45-15:00	Technaid demonstration				
15:00-16:30	T1-W-S3 Operant conditioning of spinal reflexes: from basic science to functional changes in health and disease	T2-W-S3 Advances in understanding human movement and motor interactions (I)	T3-W-S3 Wearable human-robot interfaces for upper limb function recovering	T4-W-S3 Human gait simulation for exoskeleton	S7 - Neural interfacing with wearable robots
16:30-17:00	Coffee break				
17:00-18:-30	T1-W-S4 Motor impairments following changes in brainstem output following stroke and spinal cord injury	T2-W-S4 Advances in understanding human movement and motor interactions (II)	T3-W-S4 Next generation bionics	T4-W-S4 BCI-driven approaches for motor cognitive rehabilitation after stroke	

T1-W-S1		New approaches for targeted neuromodulation of the motor nervous system (I)		Day	Time
		Chairs: U. Ziemann, J. Ibañez	Organizers: U. Ziemann, J. Ibañez, S. Piazza	We19	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	233	Novel non-invasive brain stimulation techniques to modify brain networks after stroke	Ulf Ziemann		
10.10	126	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		
10.30	249	Effect of feedback type on the effectiveness of a novel associative BCI protocol targeting the tibialis anterior muscle	Natalie Mrachacz-Kersting		
10.50	261	Static Magnetic Field Stimulation: an ancient-novel member of the non-invasive brain stimulation techniques	Antonio Oliviero		

T2-W-S1		Biomechanics and movement analysis in rehabilitation (I)		Day	Time
		Chairs: J. Belda, M. P. Serra	Organizers: Chairs: J. Belda, M. P. Serra	We19	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	16	Stance Sub-Phases Gait Event Detection in Real-time for Ramp Ascent and Descent	Hafiz Farhan Maqbool, Muhammad Afif Husman, Mohammed Ibrahim Awad, Alireza Abouhossein, Nadeem Iqbal and Abbas Dehghani-Sanij		
10.02	31	Is clinical gait analysis useful in guiding rehabilitation therapy decisions in patients with spinal cord damage?	Anna Murphy, Barry Rawicki, Stella Kravtsov and Peter New		
10.25	145	Phonatory and Articulatory Correlates in Kinematic Neuromotor Degeneration	Cristina Carmona-Duarte, Pedro Gómez-Vilda, Rejean Plamondon, Victoria Rodellar, Daniel Palacios Alonso, Miguel Ángel Ferrer-Ballester and Jesús Bernardino Alonso-Hernández		
10.47	162	Analysis and Quantification of Upper-Limb Movement in Motor Rehabilitation After Stroke	R. Mariana Silva, Emanuel Sousa, Pedro Fonseca, Ana Rita Pinheiro, Cláudia Silva, Miguel V. Correia and Sandra Moura		

T3-W-S1		Wearable human-robot interfaces for upper limb functional recovering		Day	Time
		Chairs: N. Vitiello, N. García	Organizers: N. Vitiello, N. García	We19	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	45	Wearable elbow exoskeleton actuated with Shape Memory Alloy	Dorin Sabin Copaci, Dolores Blanco, Antonio Flores Caballero and Luis Moreno		
9.58	60	Intuitive control of a prosthetic elbow	Manelle Merad, Agnès Roby-Brami and Nathanaël Jarrassé		
10.16	98	Interaction Force Estimation for Transparency Control on Wearable Robots Using a Kalman Filter	Thiago Boaventura Cunha, Lisa Hammer and Jonas Buchli		
10.34	100	Validation of a gravity compensation algorithm for a shoulder-elbow exoskeleton for neurological rehabilitation	Simona Crea, Marco Cempini, Matteo Moisè, Andrea Baldoni, Emilio Trigili, Dario Marconi, Mario Cortese, Francesco Giovacchini, Federico Posteraro and Nicola Vitiello		
10.52	104	A Robot-Assisted Neuro-Rehabilitation System for Post-Stroke Patients' Motor Skill Evaluation with ALEx exoskeleton	Fabio Stroppa, Claudio Loconsole, Simone Marcheschi and Antonio Frisoli		

T4-W-S1		Neural signal processing of the pathological brain		Day	Time
		Chairs: R. Hornero, J. Poza	Organizers: R. Hornero, J. Poza	We19	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	35	Analysis of Functional Connectivity during an Auditory Oddball Task in Schizophrenia	Pablo Núñez, Jesús Poza, Alejandro Bachiller, Javier Gomez-Pilar, Carlos Gómez, Alba Lubeiro, Vicente Molina and Roberto Hornero		
9.58	99	Event-Related Phase-Amplitude Coupling: a comparative study	Alejandro Bachiller, Javier Gomez-Pilar, Jesús Poza, Pablo Nuñez, Carlos Gómez, Alba Lubeiro, Vicente Molina and Roberto Hornero		
10.16	128	Assessment of Effective Connectivity in Alzheimer's Disease Using Granger Causality	Celia Juan-Cruz, Carlos Gómez, Jesús Poza, Alberto Fernández and Roberto Hornero		
10.34	152	Visual detection of High Frequency Oscillations in MEG	Carolina Migliorelli, Joan Francesc Alonso, Sergio Romero, Miguel Angel Mañanas, Rafal Nowak and Antonio Russi		
10.52	228	On recalibration strategies for Brain-Computer Interfaces based on the detection of motor intentions	Jaime Ibáñez, Eduardo López-Larraz, Luis Montesano and José Luis Pons		

T1-W-S2		ºNew approaches for targeted neuromodulation of the motor nervous system (II)		Day	Time
		Chairs: J. Ibañez, U. Ziemann	Organizers: J. Ibañez, U. Ziemann, S. Piazza	We19	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	133	Operant Conditioning of the Tibialis Anterior Motor Evoked Potential to Transcranial Magnetic Stimulation	Aiko Thompson, Rachel Cote and Christina Thompson		
11.48	210	Cycling with plantar stimulation increases cutaneomuscular-conditioned spinal excitability in subjects with incomplete spinal cord injury	Stefano Piazza, Diego Serrano, Julio Gómez-Soriano, Diego Torricelli, Gerardo Avila-Martin, Iriana Galan-Arriero, José L. Pons and Julian Taylor		
12.06	13	Identifying Spinal lesion Site from Surface EMG Grid Recordings	Babak Afsharipour, Milap Sandhu, Ghulam Rasool, Nina Suresh and William Rymer		
12.24	127	New tools for old problems: magnetic stimulation to study (and help) the brain	Casto Rivadulla, Jordi Aguila-Macias, Sandra Prieto-Soler, Juan Aguilar and Javier Cudeiro		
12.42		Neuromodulation of the cervical spinal cord facilitates skilled forepaw recovery in spinal cord in injured rats	Guillermo García		

T2-W-S2		Biomechanics and movement analysis in rehabilitation (II)		Day	Time
		Chairs: J. Belda, M. P. Serra	Organizers: J. Belda, M. P. Serra	We19	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	177	Effect of motor-cognitive (dual task) rehabilitation program on gait biomechanics in Parkinson's disease: case study	Constanza San Martín, José Manuel Tomás and Pilar Serra		
11.52	180	Reliability of Functional Principal Components Decomposition of Ground Reaction Forces in Post-Stroke Patients	María José Vivas Broseta and Juan Manuel Belda Lois		
12.15	91	Interactive locomotion of mechanically coupled bipedal agents: Modeling and Experiments	Jessica Lanini, Alexis Duburcq and Auke Ijspeert		
12.38	42	Interference during simultaneous performance of a motor and cognitive task involving the upper extremity after stroke	Gerdienke Prange-Lasonder, Verónica Robles-García, Simon Brown, Jaap Buurke, Jill Whitall and Jane Burridge		

T3-W-S2		Soft wearable robotics: potential for neurorehabilitation		Day	Time
		Chairs: C. Walsh, J. Pons	Organizers: C. Walsh	We19	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	102	MAXX: Mobility Assisting teXtile eXoskeleton that Exploits Neural Control Synergies	Kai Schmidt and Robert Riener		
11.52	161	Soft Printable Pneumatics for Wrist Rehabilitation	Hong Kai Yap, Hui Yong Ng and Chen Hua Yeow		
12.15	175	Use of an Actuated Glove to Facilitate Hand Rehabilitation after Stroke	Ning Yuan, Kelly Theilbar, Li-Qun Zhang and Derek Kamper		
12.38	212	Design and Preliminary Testing of a Soft Exosuit for Assisting Elbow Movements and Hand Grasping	Michele Xiloyannis, Leonardo Cappello, Khan Dinh Binh, Chris Wilson Antuvan and Lorenzo Masia		

T4-W-S2		Data mining and physiological signal		Day	Time
		Chairs: J. Abascal, J. Muguerza	Organizers: J. Abascal, J. Muguerza	We19	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	6	A Stress Classification System based on Arousal Analysis of the Nervous System	Raquel Martínez, Julio Abascal, Andoni Arruti, Eloy Irigoyen, José I. Martín and Javier Muguerza		
11.48	21	Spectral Regression Kernel Discriminant Analysis for P300 Speller Based Brain-Computer Interfaces	Víctor Martínez-Cagigal, Pablo Núñez and Roberto Hornero		
12.06	75	Supervised+Unsupervised Classification for Human Pose Estimation with RGB-D images: a first step towards a rehabilitation system	Asier Aguado, Igor Rodriguez, Elena Lazkano and Basilio Sierra		
12.24	109	Switch mode to control a wheelchair through EEG signals	Francisco Velasco-Álvarez, Álvaro Rodríguez-Fernández and Ricardo Ron-Angevin		
12.42	192	The Biosignal C.A.O.S.: Reflections on the Usability of Physiological Sensing for Human-Computer Interaction Practitioners and Researchers	Hugo Plácido Da Silva		

T1-W-S3		Operant conditioning of spinal reflexes: From basic science to functional changes in health & disease		Day	Time
		Chairs: N. Mrachacz-K., J. Wolpaw	Organizers: N. Mrachacz-K., J. Wolpaw	We19	15.00-16.30
Time	Paper ID	Title	Authors		
15.00	134	Effects of H-reflex Operant Conditioning in Humans	Aiko Thompson, Stephanie Pudlik and Christina Thompson		
15.30	250	Operant conditioning of the human soleus short latency stretch reflex and implications for the medium latency soleus stretch reflex	Natalie Mrachacz-Kersting and Uwe Gustav Kersting		
16.00		Spinal Reflex Conditioning: Mechanisms and Implications	Jonathan R. Wolpaw		

T2-W-S3		Advances in Understanding Human Movement and Motor Interactions (I)		Day	Time
		Chairs: J. González, M. Sartori	Organizers: Chairs: J. González, D. Kulić	We19	15.00-16.30
Time	Paper ID	Title	Authors		
15.00	28	Human Movement Execution Control Combined with Posture Control - A Neurorobotics Approach	Thomas Mergner and Vittorio Lippi		
15.18	32	Fortifying Descending Motor Pathways Via Progressively Repetitive Upper and Lower Extremity Exercises	Emel Demircan and Javier Rodriguez		
15.36	191	Modelling collaborative strategies in physical human-human interaction	Vinil Thekkedath Chackochan and Vittorio Sanguineti		
15.54	113	Soft robots that mimic the neuromusculoskeletal system	Manolo Garabini, Cosimo Della Santina, Matteo Bianchi, Manuel Giuseppe Catalano, Giorgio Grioli and Antonio Bicchi		
16.12	205	Predictive Framework of Human Locomotion Based on Neuromuscular Primitives and Modeling	Massimo Sartori, Jose Gonzalez-Vargas, Strahinja Dosen, Jose Pons and Dario Farina		

T3-W-S3		Wearable human-robot interfaces for upper limb functional recovering		Day	Time
		Chairs: N. Vitiello, N. García	Organizers: N. Vitiello, N. García	We19	15.00-16.30
Time	Paper ID	Title	Authors		
15.00	121	Rhythmic movements after a stroke: a different motor primitive should receive a dedicated training	Patricia Leconte and Renaud Ronsse		
15.18	156	Multimodal control architecture for Assistive Robotics	Jose Maria Catalan, Jorge Diez, Arturo Bertomeu-Motos, Francisco J. Badesa and Nicolas Garcia-Aracil		
15.36	179	Rationale of an integrated robotic approach for upper limb functional rehabilitation	Giada Sgherri, Giuseppe Lamola, Chiara Fanciullacci, Michele Barsotti, Edoardo Sotgiu, Daniele Leonardis, Caterina Procopio, Bruno Rossi, Antonio Frisoli and Carmelo Chisari		
15.54	198	Novel mixed active hand exoskeleton and assistive arm device for intensive rehabilitative treatment for stroke patients	Michele Barsotti, Edoardo Sotgiu, Daniele Leonardis, Giada Sgherri, Giuseppe Lamola, Chiara Fanciullacci, Caterina Procopio, Carmelo Chisari and Antonio Frisoli		
16.12	236	Design of a prono-supination mechanism for activities of daily living	Jorge Díez, Andrea Blanco, José María Catalán, Francisco Javier Badesa, Jose Maria Sabater-Navarro and Nicolas Garcia-Aracil		

T4-W-S3		Human gait simulation for exoskeleton design and patient adaptation		Day	Time
		Chairs: J.M. Font-Llagunes, J. Cuadrado	Organizers: J.M. Font-Llagunes, F.J. Alonso, J. Cuadrado	We19	15.00-16.30
Time	Paper ID	Title	Authors		
15.00	2	Evaluation of motion/force transmission between passive/active orthosis and subject through forward dynamic analysis	Francisco Mouzo, Urbano Lugris, Javier Cuadrado, Josep M. Font-Llagunes and Francisco J. Alonso		
15.23	77	Model-based optimization for the design of exoskeletons that help humans to sustain large pushes while walking	R. Malin Schemschat, Debora Clever and Katja Mombaur		
15.45	204	Neuromusculoskeletal Models of Human-Machine Interaction in Individuals Wearing Lower Limb Assistive Technologies	Massimo Sartori, Guillaume Durandau and Dario Farina		
16.08	253	Design, Analysis and Simulation of a Novel Device for Locomotion Support	Rita Cardoso and Miguel Silva		

S7		Neural Interfacing of WRs		Day	Time
		Chairs: J.L. Contreras-Vidal, Lee Kyuhwa	Organizers: J.L. Contreras-Vidal, Lee Kyuhwa	We19	15.00-16.30
Time	**Paper ID**	**Title**	**Authors**		
15.00	WR-30	Endogenous Control of Powered Lower-limb Exoskeleton	Kyuhwa Lee, Dong Liu, Laetitia Perroud, Ricardo Chavarriaga and José Millán		
15.18	WR-31	Natural User-Controlled Ambulation of Lower Extremity Exoskeletons for Individuals with Spinal Cord Injury	Kiran Karunakaran, Ghaith Androwis and Richard Foulds		
15.36	WR-62	Real-Time Modeling for Lower Limb Exoskeletons	Guillaume Durandau, Massimo Sartori, Magdo Bortole, Juan Moreno, José Pons and Dario Farina		
15.54	WR-71	Analysis of Steady State Visual Evoked Potentials for Lower Limb Exoskeleton Control based on Brain-Computer Interface	No-Sang Kwak, Klaus-Robert Müller and Seong-Whan Lee		
16.12	WR-81	Towards Everyday Shared Control of Lower Limb Exoskeletons	Tom Carlson		

T1-W-S4	Motor Impairments following changes in brainstem output following stroke and spinal injury		Day	Time
	Chairs: CJ Heckman, D. Farina	Organizers: CJ Heckman	We19	17.00-18.30
Paper ID	**Title**	**Authors**		
242	Motor impairments following changes in brainstem output following stroke and spinal injury	CJ Heckman, Jules Dewald, Chris Thompson and Mike Ellis		

T2-W-S4		Advances in Understanding Human Movement and Motor Interactions (II)		Day	Time
		Chairs: J. González, K. Mombaur	Organizers: J. González, D. Kulić	We19	17.00-18.30
Time	**Paper ID**	**Title**	**Authors**		
17.00	202	Towards a better understanding of stability in human walking using model-based optimal control and experimental data	Katja Mombaur, C. Javier Gonzalez and Martin Felis		
17.23	168	Gait abnormalities of above knee amputees, is it a design deficiency or compensatory strategy?	Alireza Abouhossein, Mohammed I. Awad, Carl Crisp, Abbas A. Dehghani, Neil Messenger, Todd D. Stewart, Osvaldo M. Querin, Robert C. Richardson and David Bradley		
17.45	207	A Novel Controller for Bipedal Locomotion Integrating Feed-forward and Feedback Mechanisms	Xiaofeng Xiong, Massimo Sartori, Strahinja Dosen, Jose Gonzalez-Vargas, Florentin Woergoetter and Dario Farina		
18.08	74	A preliminary comparison of stepping responses following perturbations during overground and treadmill walking	Matjaž Zadravec, Andrej Olenšek and Zlatko Matjacic		

T3-W-S4		Next generation Bionics		Day	Time
		Chairs: F. Thorsteinsson, J.L. Pons	Organizers: F. Thorsteinsson	We19	17.00-18.30
Time	**Paper ID**	**Title**	**Authors**		
17.00	92	The quest for a bionic hand	Silvestro Micera		
17.23	108	Prosthetic Control by Lower Limb Amputees Using Implantable Myoelectric Sensors	Kristleifur Kristjansson, Jona Sigurdardottir, Atli Sverrisson, Stefan Sigurthorsson, Olafur Sverrisson, Arni Einarsson, Knut Lechler, Thorvaldur Ingvarsson and Magnus Oddsson		
17.45	166	A MyoKinetic HMI for the Control of Hand Prostheses: a Feasibility Study	Sergio Tarantino, Francesco Clemente, Diego Barone, Marco Controzzi and Christian Cipriani		
18.08	173	User Centered Design and Usability of Bionic Devices	Leonard O'Sullivan, Valerie Power, Adam de Eyto and Jesus Ortiz		

T4-W-S4		BCI driven approaches for motor-cognitive rehabilitation after stroke		**Day**	**Time**
		Chairs: D. Mattia, F. Cincotti	Organizers: D. Mattia, F. Cincotti	We19	17.00-18.30
Time	Paper ID	Title	Authors		
17.00	248	An associative Brain-Computer-Interface for acute stroke patients	Natalie Mrachacz-Kersting, Andrew James Thomas Stevenson, Susan Aliakbaryhosseinabadi, Anna Charlotte Lundgaard, Helle R Jørgensen, Kåre Severinsen and Dario Farina		
17.23	251	Brain Computer Interfaces for cognitive rehabilitation after stroke	Andrea Kübler, Sonja Kleih and Donatella Mattia		
17.45		BCIs in rehabilitation: principles and strategies	Jonathan Wolpaw		
18.08		BCIs for motor rehabilitaion after stroke:bridging the gap between research and clinical expectations	F. Cincotti		

Thursday, 20th

	Thursday 20			
8:30-9:20	Plenary - D. Farina			
9:20-9:40	Technoconcept demonstration			
9:40-11:10	T1-T-S5 Experimental approaches to restore loss of function	T2-T-S5 Clinical needs and prospects in neurorehabilitation technologies	T3-T-S5 Clinically relevant advances in upper limb prosthetics	T4-T-S5 Indirect measures of brain activity: a window into the mind
11:10-11:30	Coffee break			
11:30-13:00	T1-T-S6 Sensory Restoration and Adaptive Neural Interfaces	T2-T-S6 Clinical needs and prospects in neurorehabilitation technologies in SCI	T3-T-S6 Neuromechanical modeling for wearable assistive technologies	T4-T-S6 Feedback systems for rehabilitation and assistance
13:00-14:00	Lunch break			
14:00-14:45	Plenary - J. Wolpaw			
14:45-15:00	Gogoa demonstration			
15:00-16:30	Plenary - J. C. Rothwell			
16:30-17:00	Poster session & Coffe Break			
17:00-18:-30	Plenary - X. Navarro			

T1-T-S5		Experimental approaches to restore loss of function		Day	Time
		Chairs: O. Herreras, Javier Cudeiro	Organizers: O. Herreras	Th20	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	54	Human adult Oligodendrocyte Precursor Cell biology: the bottleneck for effective pro-remyelinating therapies for Multiple Sclerosis	Fernando de Castro		
9.58	120	Modulation of Input-Output balance by the Axon Initial Segment	Juan José Garrido		
10.16	220	Using LFP generators to detect abnormal activity in multiple networks: a tool to explore diaschisis	Oscar Herreras, Daniel Torres, Tania Ortuño and Julia Makarova		
10.34	265	The brain's camera. Optimal algorithms for wiring the eye to the brain shape how we see	L. M. Martínez, M. Molano-Mazón, A. J. Valiño-Perez, S. Sala, M. Martinez-Garcia, J. Malo, F.T. Sommer and J. A. Hirsch		
10.52	262	How do interconnected neuronal networks adjust to external stimulation: parametric studies of DBS-fMRI	Javier Moya, Daniel Torres, David Moratal and Santiago Canals		

T2-T-S5		Clinical needs and prospects of neurorehabilitation technology in Stroke		Day	Time
		Chairs: M. Molinari, Iris Dimbwadyo	Organizers: M. Molinari	Th20	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	12	Effectiveness of interventions to decrease the physical and mental burden and strain of informal caregivers of stroke patients: a systematic review	Ella Rubbens, Lotte De Clerck and Eva Swinnen		
9.58	14	Effect of Providing Ankle-Foot Orthosis in Patients with Acute and Subacute Stroke: a Randomized Controlled Trial	Corien Nikamp, Jaap Buurke, Job van der Palen, Hermie Hermens and Johan Rietman		
10.16	15	User acceptance of a balance support system that enables unsupervised training of balance and walking in stroke survivors	Juliet Haarman, Jasper Reenalda, Piet Lammertse, Jaap Buurke, Herman van der Kooij and Hans Rietman		
10.34	18	Upper Extremity Training with CUREs Robot in Subacute Stroke: A Pilot Study	Wasuwat Kitisomprayoonkul, Pim Bhodhiassana and Viboon Sangveraphunsiri		
10.52	95	Preliminary extraction of themes from a review about user perspectives on assistive technology for the upper limb after stroke	Anne van Ommeren, Gerdienke Prange-Lasonder, Hans Rietman, Peter Veltink and Jaap Buurke		

T3-T-S5		Advances in limb prosthetics		Day	Time
		Chairs: J.L. Pons, Thierry Keller	Organizers: J.L. Pons	Th20	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	59	Does sensory feedback in prosthetic hands provide functional benefits in daily activities of amputees?	Marko Markovic, Leonard Engels, Meike Schweisfurth, Strahinja Dosen, Daniela Wüstefeld and Dario Farina		
9.58	72	Synergy-based myocontrol of a two degree of freedom robotic arm in children with dystonia	Francesca Lunardini, Claudia Casellato, Terence D Sanger and Alessandra Pedrocchi		
10.16	140	Dynamic Stimulation Patterns for Conveying Proprioceptive Information from Multi-DOF Prosthesis	Milica Isakovic, Matija Strbac, Minja Belic, Goran Bijelic, Igor Popovic, Milutin Radotic, Strahinja Dosen, Dario Farina and Thierry Keller		
10.34	171	Evoking referred sensations of missing digits by electro-tactile stimulation: preliminary tests	Marco D'Alonzo, Ahmed Alsaqqa, Marco Controzzi and Christian Cipriani		
10.52	247	Investigation into Energy Efficiency and Regeneration in an Electric Prosthetic Knee	Mohammed Awad, Alireza Abouhossein, Benjamin Chong, Abbas Dehghani-Sanij, Robert Richardson, David Moser and Saeed Zahedi		

T4-T-S5		Indirect measures of brain activity: a window into the mind		Day	Time
		Chairs: Laura Dempere-Marco, Jordi Solé-Casals	Organizers: Laura Dempere-Marco, Jordi Solé-Casals	Th20	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	24	Short-term effects of real-time auditory display (sonification) on gait parameters in people with Parkinson's disease – a pilot study	Anna-Maria Gorgas, Lena Schoen, Ronald Dlapka, Jakob Doppler, Michael Iber, Christian Gradl, Anita Kiselka, Tarique Siragy and Brian Horsak		
10.02	27	Articulation Characterization in AD Speech Production	Pedro Gómez-Vilda, Miren Karmele López de Ipiña Peña, Victoria Rodellar, Daniel Palacios Alonso and Miriam Ecay-Torres		
10.25	226	Non-invasive biosignal analysis oriented to early diagnosis and monitoring of cognitive impairments	Karmele Lopez de Ipiña, Jordi Sole-Casals, Unai Martinez de Lizarduy, Pilar Calvo, Jon Iradi, Marcos Faundez-Zanuy and Alberto Bergareche		
10.47	244	Eye-Tracking Data in Visual Search Tasks: A Hallmark of Cognitive Function	Vicente Pallarés, Mar Hernández and Laura Dempere-Marco		

T1-T-S6		Sensory Restoration and Adaptive Neural Interfaces		Day	Time
		Chairs: Eduardo Fernández, John B. Troy	Organizers: Eduardo Fernández, John B. Troy	Th20	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	272	Monitoring Parkinson's Disease Rehabilitation from Phonation Biomechanics	P. Gómez-Vilda, P. Lirio, D. Palacios-Alonso, V. Rodellar-Biarge and N. Polo		
11.48	273	Influence of interactions between virtual channels in cochlear implants: biological stimulation using current source method	Ernesto A. Martínez–Rams, Vicente Garcerán–Hernández, Mikel Val, Eduardo Fernandez and José Manuel Ferrández		
12.06	274	Epileptic Photosensitivity: Towards implementation of preventative	Jaime Parra		
12.24	275	Neuroplasticity and Blindness: From Clinical setting to Technology Research	Arantxa Alfaro, Angela Bernabeu and Eduardo Fernández		
12.42	276	Visual prostheses – the past and the future	John B. Troy		

T2-T-S6		Clinical needs and prospects of neurorehabilitation technology in SCI		Day	Time
		Chairs: A. Gil-Agudo, J. Pons	Organizers: A. Gil-Agudo	Th20	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	4	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, Jose Luis Pons, Luis Montesano and Angel Gil- Agudo		
11.48	39	Kinematic Indices for Upper Extremity Assessment after Spinal Cord Injury: a case of study	A. de Los Reyes-Guzmán, I. Dimbwadyo-Terrer, V. Lozano-Berrio, S. Pérez-Nombela, D. Torricelli, J.L. Pons and A. Gil-Agudo		
12.06	73	Physiological evaluation of different control modes of lower limb robotic exoskeleton H2 in patients with incomplete spinal cord injury	Soraya Perez Nombela, Antonio J. Del-Ama, Guillermo Asín-Prieto, Elisa Piñuela-Martín, Vicente Lozano-Berrio, Angel Gil-Agudo, José L. Pons and Juan C. Moreno		
12.24	84	Muscle activity and coordination during robot-assisted walking with H2 exoskeleton	Antonio J. Del-Ama, Guillermo Asín-Prieto, Elisa Piñuela Martín, Soraya Perez Nombela, Vicente Lozano-Berrio, Fernando Trincado-Alonso, Jose González-Vargas, Angel Gil-Agudo, José L. Pons and Juan C. Moreno		
12.42	229	Modelling Neuromuscular Function of SCI Patients in Balancing	Hsien-Yung Huang, Ildar Farkhatdinov, Arash Arami and Etienne Burdet		

T3-T-S6		Neuromechanical Modeling for Wearable Assistive Technologies		Day	Time
		Chairs: M. Sartori, H. van der Kooij	Organizers: M. Sartori, M. Sreenivasa, H. van der Kooij,	Th20	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	214	Subject-Specificity via 3D Ultrasound and Personalized Musculoskeletal Modeling.	Massimo Sartori, Jonas Rubenson, David Lloyd, Dario Farina and Fausto Panizzolo		
11.48	67	Optimal control of neuromuscular human models for the design of wearable assistive devices	Manish Sreenivasa, Matthew Millard, Paul Manns and Katja Mombaur		
12.06	30	A model of human non-stepping postural responses as the basis for a biomimetic control strategy for robot-assisted balance	Maarten Afschrift, Joris De Schutter, Ilse Jonkers and Friedl De Groote		
12.24	282	Toward Balance Recovery with Active Leg Prostheses using Neuromuscular Model Control	Hartmut Geyer, Nitish Thatte and Helei Duan		
12.42	263	An In Vitro Approach for Directly Observing Muscle-Tendon Dynamics with Parallel Elastic Mechanical Assistance	Gregory Sawicki and Benjamin Robertson		

T4-T-S6		Feedback systems for rehabilitation and assistance		Day	Time
		Chairs: J. González, J. Ibáñez	Organizers: J. Gonzalez, J. Ibáñez	Th20	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	22	An Auditory Feedback System in Use with People aged +50 Years: Compliance and Modifications in Gait Pattern	Theresa Fischer, Anita Kiselka, Ronald Dlapka, Jakob Doppler, Michael Iber, Christian Gradl, Anna-Maria Gorgas, Tarique Siragy and Brian Horsak		
11.48	46	Supplementary Haptic Framework for Dexterous Training during Rehabilitation	Alexandra Moringen and Helge Ritter		
12.06	181	Cortical and muscle response to focal vitro-tactile stimuli	Tijana Jevtic, Aleksandar Zivanovic and Rui Loureiro		
12.24		Ankle Trajectory Generator for parametric adjustment of step length and foot clearance of walking patterns	R. Mendoza-Crespo, R. Soto, and J.L Pons		
12.42		Boosting traditional physioterapist approach for spasticity treatment by a sensorized ankle foot orthosis.	Tamburella Federica, Juan C. Moreno, Iosa Marco, Pisotta Iolanda, Muzzioli Luca, Cincotti Febo, Donatella Mattia, José L. Pons, Molinari Marco		

Friday, 21st

	Friday 21			
8:30-9:20	Plenary - M. Molinari			
9:20-9:40	BioMot Project demonstration			
9:40-11:10	T1-F-S7 Investigating neural control strategies of movement with EMG signals (I)	T2-F-S7 Interpersonal rehabilitation gaims	T3-F-S7 Motor neuroprosthetics	T4-F-S7 Role of input synergies for rehabilitation
11:10-11:30	Coffee break			
11:30-13:00	T1-F-S8 Investigating neural control strategies of movement with EMG signals (II)	T2-F-S8 Gaming and rehabilitation (I)	T3-F-S8 FES and wearable robot systems in rehabilitation and assistance of locomotion	T4-F-S8 Modular control in healthy and pathologic subjects
13:00-14:00	Lunch break			
14:00-15:00	Plenary - H. Hirata			
15:00-16:30	T1-F-S9 Extracting and modifying neocortical sensorimotor signals for BCI control	T2-F-S9 Gaming and rehabilitation (II)	T3-F-S9 Novel technologies & natural sensory feedback for phantom limb pain modulation and therapy	T4-F-S9 Muscle synergies towards clinically oriented applications
16:30-17:00	Coffee break			
17:00-18:-30	T1-F-S10 Investigation of the human neuromuscular system using human reflexes: past, present and future		T2-F-S10 Experimental approaches for restoring hand function	

T1-F-S7		Investigating neural control strategies of movement with EMG signals		**Day**	**Time**
		Chairs: D. Farina, A. Holobar	Organizers: D. Farina, R. Merletti, A. Holobar	Fr21	9.40-11.10
Time	Paper ID	Title		Authors	
9.40	49	Introduction to EMG for the study of movement: From bipolar to high-density		Subaryani Dambawati Harjaya Soedirdjo, Babak Afsharipour, Paolo Cattarello and Roberto Merletti	
10.02	56	A novel measure of motor unit action potential variability in nonstationary surface electromyograms		Vojko Glaser and Aleš Holobar	
10.25	135	Neural Control of Muscles in Tremor Patients		Juan A. Gallego, Jakob L. Dideriksen, Ales Holobar, Eduardo Rocon, José L. Pons and Dario Farina	
10.47	158	Corticospinal coherence during frequency-modulated isometric ankle dorsiflexion		Andrés Úbeda, Alessandro Del Vecchio, Massimo Sartori, Utku Yavuz, Francesco Negro, Francesco Felici, Jose M. Azorin and Dario Farina	

T2-F-S7		Interpersonal Rehabilitation Games		**Day**	**Time**
		Chairs: E. Burdet, R. Loureiro	Organizers: E. Burdet	Fr21	9.40-11.10
Time	Paper ID	Title		Authors	
9.40	53	Motivation and exercise intensity in competition and cooperation between a patient and unimpaired person in arm rehabilitation		Maja Goršič, Imre Cikajlo and Domen Novak	
10.02	196	Towards Pervasive Motor and Cognitive Rehabilitation Strategies Mediated by Social Interaction		Hoang Ha Le, Martin Loomes and Rui Loureiro	
10.25	211	Collaborative gaming to enhance patient performance during virtual therapy		Michael Mace, Paul Rinne, Nawal Kinany, Paul Bentley and Etienne Burdet	
10.47	254	Flowing to the optimal challenge: an adaptive challenge framework for multiplayer games		Jaime Duarte, Kilian Baur and Robert Riener	

T3-F-S7		Motor Neuroprosthetics		Day	Time
		Chairs: T. Keller, R. Kirsch	Organizers: T. Keller	Fr21	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	96	Clinical Trial Protocol for Analyzing the Effect of the Intensity of FES-Based Therapy on Post-Stroke Foot Drop	Eukene Imatz-Ojanguren, Haritz Zabaleta, David Valencia-Blanco, Jovana Malesevic, Milos Kostic and Thierry Keller		
9.58	136	TMR improves performance of compensatory tracking using myoelectric control	Meike Schweisfurth, Tashina Bentz, Strahinja Dosen, Jennifer Ernst, Marko Markovic, Gunther Felmerer, Oskar Aszmann and Dario Farina		
10.16	169	Injectable Stimulators Based on Rectification of High Frequency Current Bursts: Power Efficiency of 2 mm Thick Prototypes	Laura Becerra-Fajardo, Roser Garcia-Arnau and Antoni Ivorra		
10.34	188	Quasi-Static Control of Whole-Arm Motions with FES	Eric Schearer, Derek Wolf and Robert Kirsch		
10.52	201	Hybrid Robotic System for Reaching Rehabilitation after Stroke: reporting an usability experimentation	Francisco Resquin, Jose Gonzalez, Jaime Ibáñez, Iris Dimbwadyo, Susana Alves, Laura Torres, Laura Carrasco, Fernando Brunetti and José Luis Pons		

T4-F-S7		Role of Input Synergies for rehabilitation		Day	Time
		Chairs: S. Shimoda, F. Shibata	Organizers: S. Shimoda	Fr21	9.40-11.10
Time	Paper ID	Title	Authors		
9.40	132	The Role of Inputs Combination to Enhance the Internal Model and Body Control Ability	Fady Shibata Alnajjar, Fatimah Harib, Shaima Alameri, Asma Almarzoqi, Matti Itkonen, Hiroshi Yamasaki and Shingo Shimoda		
10.02	223	Feeling of bodily congruence to visual stimuli improves motor imagery based Brain-Computer Interface control	Junichi Ushiba, Shotaro Miyashita, Takashi Ono, Koji Aono, Mitsuhiko Kodama and Yoshihisa Masakado		
10.25	137	The repertoire of brain synchronized states accounts for stroke recovery	Keiichi Kitajo, Yutaka Uno, Noriaki Hattori, Teiji Kawano, Yuka O. Okazaki		
10.47	200	Is modular control of cycling affected by learning? Preliminary results using muscle biofeedback	Diego Torricelli, Daniel Nemati, Cristiano De Marchis, Filipe Barroso and José L. Pons		

T1-F-S8		Investigating neural control strategies of movement with EMG signals		Day	Time
		Chairs: R. Merletti, A. Holobar	Organizers: D. Farina, R. Merletti, A. Holobar	Fr21	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	215	Stretch reflexes in shoulder muscles are described best by heteronymous pathways	Hongchul Sohn, Emma Baillargeon, David Lipps and Eric Perreault		
11.52	221	Identifying Motor Units in Longitudinal Studies with High-Density Surface Electromyography	Eduardo Martinez-Valdes, Francesco Negro, Christopher Laine, Deborah Falla, Frank Mayer and Dario Farina		
12.15	252	Transfer Learning for Rapid Re-calibration of a Myoelectric Prosthesis after Electrode Shift	Cosima Prahm, Benjamin Paaßen, Alexander Schulz, Barbara Hammer, Oskar Aszmann		
12.38	178	EMG discrete classification towards a myoelectric control of a robotic exoskeleton for motor rehabilitation	Nerea Irastorza-Landa, Andrea Sarasola Sanz, Julius Klein, David Valencia, Aitor Belloso, Fabrice O. Morin, Farid Shiman, Eduardo López-Larraz, Niels Birbaumer and Ander Ramos-Murguialday		

T2-F-S8		Gaming and rehabilitation		Day	Time
		Chairs: F. Brunetti, R. Raya	Organizers: F. Brunetti, R. Raya, E. Rocon	Fr21	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	40	Assessing the gaming experience of an applied game for rehabilitation of the arm and hand function: a feasibility study	Anke Kottink, Gerdienke Prange-Lasonder, Johan Rietman and Jaap Buurke		
11.48	43	Combining EEG and Serious Games for Attention Assessment of children with Cerebral Palsy	Francisco Perales and Esperanza Amengual		
12.06	69	INTERPLAY - Advanced console for the playful rehabilitation of children with neuromotor disabilities	Alejandro Clemotte, Miguel A. Velasco, Rafael Raya, Ramón Ceres, Patricia Andradas, Clara Talegón, Miguel Angel Iñigo, Noemi Rando, Lucía Zumárraga, Jon Arambarri and Eduardo Rocon		
12.24	70	ViTAS gaming suite: Virtual Therapy Against Stroke	Diego Dall'Alba, Iris Dimbwadyo, Stefano Piazza, Enrico Magnabosco, Giovanni Menegozzo and Paolo Fiorini		
12.42	82	Game-based assessment in upper-limb post-stroke telerehabilitation	Cristina Rodríguez-De-Pablo, Andrej Savić and Thierry Keller		

T3-F-S8		FES and wearable robot systems in rehabilitation and assistance of locomotion		Day	Time
		Chairs: J.C. Moreno, A. Del Ama	Organizers: J.C. Moreno	Fr21	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	90	Dynamic Optimization of A Hybrid Gait Neuroprosthesis to Improve Efficiency and Walking Duration: A Simulation Study	Nicholas Kirsch, Naji Alibeji and Nitin Sharma		
11.48	97	Preliminary Experiments of an Adaptive Low-Dimensional Control for a Hybrid Neuroprosthesis	Naji Alibeji, Nicholas Kirsch and Nitin Sharma		
12.06	125	The potential of inertial sensors in posture, gait and cycling FES-assistance	Christine Azevedo Coste, Benoit Sijobert, Christian Geny, Jérôme Froger and Charles Fattal		
12.24	155	Online Monitoring of Muscle Activity during Walking for Bio-Feedback and for Observing the Effects of Transcutaneous Electrical Stimulation	Nathan Bunt, Juan Moreno, Philipp Müller, Thomas Seel and Thomas Schauer		
12.42	190	Walking Assistance through Impedance Control of a Lower-limb Exoskeleton	Weiguang Huo and Samer Mohammed		

T4-F-S8		Modular control in healthy and pathologic subjects		Day	Time
		Chairs: S. Shimoda, D. Torricelli	Organizers: S. Shimoda, D. Torricelli	Fr21	11.30-13.00
Time	Paper ID	Title	Authors		
11.30	33	Posture Dependent Spatiotemporal Modulation of Dynamic Torques during Sit-to-Stand Movements	Hiroshi Yamasaki and Shingo Shimoda		
11.52	142	Different Temporal Structure of Muscle Synergy between Sit-to-Walk and Sit-to-Stand Motions in Human Standing Leg	Qi An, Hiroshi Yamakawa, Atsushi Yamashita and Hajime Asama		
12.15	217	Changes in muscle synergy organization after neurological lesions	Denise Berger, Francesca Ferrari, Ambra Esposito, Marcella Masciullo, Marco Molinari, Francesco Lacquaniti and Andrea d'Avella		
12.38	26	Muscle Synergy Analysis in Transtibial Amputee during Ramp Descending Activity	Pouyan Mehryar, Mohammad Sharif Shourijeh and Abbas Dehghani-Sanij		

T1-F-S9		Extracting and modifying neocortical sensorimotor signals for BCI control		Day	Time
		Chairs: A. Gail, H. Scherberger	Organizers: A. Gail	Fr21	15.00-16.30
Time	Paper ID	Title	Authors		
15.00	237	Development of an Afferent Neural Interface Designed to Mimic Natural Proprioception	Raeed Chowdhury, Tucker Tomlinson and Lee Miller		
15.23	239	Adaptation of motor planning activity in monkey motor, premotor and parietal cortices during BCI control of 3D reaches	Enrico Ferrea, Pierre Morel, Michael Berger and Alexander Gail		
15.45	255	Decoding grasp movements from motor, premotor, and parietal brain areas	Hans Scherberger		
16.08		Pushing the limits of BCI performance with new tasks and algorithms	A. Batista		

T2-F-S9		Gaming and rehabilitation		Day	Time
		Chairs: F. Brunetti, E. Rocon	Organizers: F. Brunetti, R. Raya, E. Rocon	Fr21	15.00-16.30
Time	Paper ID	Title	Authors		
15.00	86	NAO robot as rehabilitation assistant in a Kinect controlled system	Igor Rodriguez, Asier Aguado, Oihane Parra, Elena Lazkano and Basilio Sierra		
15.18	110	Hand rehabilitation with toys with embedded sensors	N. Alberto Borghese, Renato Mainetti, Jacopo Essenziale, Erica Cavalli, Elena Marta Mancon and Giorgio Pajardi		
15.36	157	Exergames as treatment and prevention of dysgraphia	N. Alberto Borghese, Caterina Palmiotto, Jacopo Essenziale, Renato Mainetti, Elisa Granocchio, Bruna Molteni, Daniela Sarti, Teresa Guasti, Natale Stucchi, Alesssandra Pedrocchi and Simona Ferrante		
15.54	193	Examining VR/Robotic Hand Retraining in an Acute Rehabilitation Unit: A Pilot Study	Alma Merians, Mathew Yarossi, Jigna Patel, Qinyin Qiu, Gerard Fluet and Sergei Adamovich		
16.12	197	Serious Game and Wearable Haptic Devices for Neuro Motor Rehabilitation of Children with Cerebral Palsy	Ilaria Bortone, Daniele Leonardis, Massimiliano Solazzi, Caterina Procopio, Alessandra Crecchi, Lucia Briscese, Paolo Andre, Luca Bonfiglio and Antonio Frisoli		

T3-F-S9		Novel technologies & natural sensory feedback for phantom limb pain modulation and therapy		Day	Time
		Chairs: T. Stieglitz, W. Jensen	Organizers: T. Stieglitz, W. Jensen	Fr21	15.00-16.30
Time	Paper ID	Title	Authors		
15.00	138	Natural Sensory Feedback for Phantom Limb Pain Modulation and Therapy	Winnie Jensen		
15.18	167	Evaluation of the effect of sensory feedback on phantom limb pain in multi-center clinical trials	Ken Yoshida, James Malec, Caleb Comoglio, Kristine Mosier, Romulus Lontis, Knud Larsen, Xavier Navarro and Winnie Jensen		
15.36	176	On biocompatibility and stability of transversal intrafascicular multichannel electrodes - TIME	Thomas Stieglitz, Tim Boretius, Paul Cvancara, David Guiraud, Thomas Guiho, Víctor M. López-Álvarez and Xavier Navarro		
15.54	186	On the use of intraneural transversal electrodes to develop bidirectional bionic limbs	Silvestro Micera, Stanisa Raspopovic, Francesco Petrini, Jacopo Carpaneto, Calogero Oddo, Jordi Badia, Thomas Stieglitz, Xavier Navarro and Paolo Rossini		
16.12	187	Advanced 56 channels stimulation system to drive intrafascicular electrodes	Thomas Guiho, David Andreu, Víctor M. López-Álvarez, Paul Cvancara, Arthur Hiairrassary, Giuseppe Granata, Loic Wauters, Winnie Jensen, Jean Louis Divoux, Silvestro Micera, Thomas Stieglitz, Xavier Navarro and David Guiraud		

T4-F-S9		Muscle synergies: towards clinically oriented applications		Day	Time
		Chairs: D. Torricelli, C. De Marchis	Organizers: D. Torricelli, C. De Marchis	Fr21	15.00-16.30
Time	Paper ID	Title	Authors		
15.00	164	Evaluation of a pose-shared synergy-based isometric model for hand force estimation: towards myocontrol	Domenico Buongiorno, Francesco Barone, Denise J. Berger, Benedetta Cesqui, Vitoantonio Bevilacqua, Andrea d'Avella and Antonio Frisoli		
15.18	29	Muscle Synergies Indices to Quantify the Human Skilled Behavior	Fady S.Alnajjar and Shingo Shimoda		
15.36	147	Towards a Myoelectrically Controlled Virtual Reality Interface for Synergy-Based Stroke Rehabilitation	Denise Berger and Andrea D'Avella		
15.54	139	FES-drop-foot correction: from pre-programmed patterns online modulation	Christine Azevedo Coste, Benoit Sijobert and Jérôme Froger		
16.12	279	A biologically-inspired robust control system for myoelectric control.	S. Muceli, I. Vujaklija, N. Jiang, S. Amsuess, B. Graimann, O. C. Aszmann, and D. Farina		

T1-F-S10		Investigation of the human neuromuscular system using human reflexes: Past, Present and the Future		Day	Time
		Chairs: Kemal Turker, Utku Yavuz	Organizers: Kemal Turker	Fr21	17.00-18.30
Time	Paper ID	Title	Authors		
17.00	47	Difficulties faced in standardized receptor stimulation and in standardized analysis of muscle responses to a stimulus	Kemal Turker		
17.23	48	The reflex circuitry originating from the cutaneous receptors of the hand to the first dorsal interosseous muscle	Kemal Turker and Mehmet Kahya		
17.45	65	Reflex circuitry originating from the muscle spindles to the tibialis anterior muscle	Utku S. Yavuz, Francesco Negro, Robin Diedrichs, Kemal S. Türker and Dario Farina		
18.08	83	Jaw Reflexes Originating from the Periodontal and Muscle Spindle Receptors to the Jaw Muscles	Gizem Yılmaz, Kemal S. Türker and Paulius Uginčius		

T2-F-S10		Experimental approaches for restoring hand function		Day	Time
		Chairs: M. Santello, J. Gonzalez	Organizers: M. Santello	Fr21	17.00-18.30
Time	Paper ID	Title	Authors		
17.00	174	Introduction of an EMG-controlled Game to Facilitate Hand Rehabilitation After Stroke	Mohammad Ghassemi, Rajiv Ranganathan, Alex Barry, Kristen Triandafilou and Derek Kamper		
17.23	230	Learning interference in dynamic manipulation with redundant degrees of freedom	Qiushi Fu and Marco Santello		
17.45	238	Pinching performance of spinal cord injured patient with Exo-Glove with respect to the tendon route design	Hyunki In, Brian Byunghyun Kang and Kyu-Jin Cho		
18.08	240	The SoftHand Pro: Translation from Robotic Hand to Prosthetic Prototype	Sasha Godfrey, Matteo Bianchi, Kristin Zhao, Manuel Catalano, Ryan Breighner, Amanda Theuer, Karen Andrews, Giorgio Grioli, Marco Santello and Antonio Bicchi		

PLENARY LECTURES

Alvaro Pascual-Leone, M.D., Ph.D.
Professor in Neurology
Associate Dean for Clinical and Translational Research
Harvard Medical SchoolChief, Division of Cognitive Neurology
Director, Berenson-Allen Center for Non-Invasive Brain Stimulation
Beth Israel Deaconess Medical Center
Boston

Alvaro Pascual-Leone, MD, PhD, is Professor of Neurology and an Associate Dean for Clinical and Translational Research at Harvard Medical School. He serves as Chief for the Division of Cognitive Neurology and the Director of the Berenson-Allen Center for Noninvasive Brain Stimulation at Beth Israel Deaconess Medical Center.

Dr. Pascual-Leone is a world leader in the field of noninvasive brain stimulation where his contributions span from technology development, through basic neurobiologic insights from animal studies and modeling approaches, to human proof-of-principle and multicenter clinical trials. His research has been fundamental in establishing the field of therapeutic brain stimulation. His work has provided evidence for the efficacy of noninvasive brain stimulation in treating various neurologic and psychiatric conditions, including epilepsy, stroke, Parkinson disease, chronic pain, autism, and drug-resistant depression.

Dr. Pascual-Leone has authored more than 600 scientific papers as well as several books, and is listed inventor in several patents. His work is highly regarded for its innovation and quality and is highly cited.

Dr. Pascual-Leone is the recipient of several international honors and awards, including the Ramón y Cajal Award in Neuroscience (Spain), the Norman Geschwind Prize in Behavioral Neurology from the American Academy of Neurology, the Friedrich Wilhelm Bessel Research Award from the Alexander von Humboldt Foundation (Germany), and the Jean-Louis Signoret Prize from the Ipsen Foundation (France). He is an elected member of the Spanish Royal Academy of Science (Farmacia). His work also has wide general public appeal and outreach through dissemination in articles in the lay press (Time Magazine, Newsweek, New Scientist, National Geographic) and documentaries on television and radio (Scientific American, 60 minutes, CNN, BBC, Discovery, National Geographic, etc.).

Marco Molinari, M.D., Ph.D.

Director Neurological and Spinal Cord Injury Rehabilitation A.
Director Clinical Translational Research.
Head Neuro-Robot Rehabilitation Lab
IRCCS Fondazione S. Lucia

Since obtaining his MD degree, Dr. Molinari has been involved in diagnosis and treatment of Neurological diseases with special focus on stroke patients and their rehabilitation. 1984/1998 Neurological ward and Neuropsychology unit at the Institute of Neurology Catholic University Rome. EEG diagnosis, Clinical Neuropsychology. 1998/present Hospital and Research Center IRCCS Santa Lucia Foundation in Roma: Department Director UNIT A of Neurorehabilitation (Personnel: 6MDs,1 psychologist, 26 nurses, 14 physiotherapists, 7 researchers) : Neurorehabilitation ward (30 beds), Spinal cord rehab unit (23 beds), outpatient rehabilitation (10 beds). Associated research labs: Ataxia Lab (Experimental Neuropsychology), CaRMA Lab (Clinical and Research Movement Analyses) and Experimental Neurorehabilitation Lab (Animal Models of CNS damage/ Functional recovery). Clinical duties: Neurological rehabilitation for in and out-patients. Main pathologies: stroke and spinal cord injuries. Research fields: neurological rehabilitation, Spinal cord Injury, Stroke, Experimental models of neurodegeneration, Cerebellar pathology and neurophysiology, Technological and neuroscience based applications to neurological rehabilitation.

Dario Farina, Ph.D.
Department of Neurorehabilitation Engineering
Bernstein Focus Neurotechnology (BFNT) Göttingen
Bernstein Center for Computational Neuroscience Göttingen
University Medical Center Göttingen
Georg-August University, Germany

After a period (2002-2004) as Research Assistant Professor at Politecnico di Torino, he moved to Aalborg University, Denmark, where he was an Associate Professor in Biomedical Engineering (2004-2008) and then Full Professor in Motor Control and Biomedical Signal Processing (2008-2010). In the latter period, he has been the Head of the Research Group on Neural Engineering and Neurophysiology of Movement at Aalborg University. In 2010 he was appointed Full Professor and Founding Chair of the Department of Neurorehabilitation Engineering at the University Medical Center Göttingen, Georg-August University, Germany, within the Bernstein Center for

Computational Neuroscience Göttingen. He is currently the Chair for Neuroinformatics of the Bernstein Focus Neurotechnology of Göttingen. His research spans engineering, physiology, neuroscience, and clinical sciences in a translational approach and focuses on the study of neural control of movement and on methods to replace, restore, and modulate lost or impaired motor functions.

John B. Troy, Ph.D.
Professor of Biomedical Engineering
Biomedical Engineering Department
Northwestern University

John B. Troy, Professor of Biomedical Engineering at Northwestern University, has a B.S. (1st class honors) in Biologoy with Physics from the University of London, King's College, a B.A. (2nd class honors) in Politics from the University of Reading and a D.Phil. from the University of Sussex, all in the U.K. His research is within the broad area of Neural Engineering with a focus on signal processing within the nervous system and the development of technology for neuroscience research and neuroprosthetics. In recent years he has applied nanotechnology to his work on developing tools for neuroscience and neuroprosthetics research. Funding of his research has come from the NIH, the NSF, NATO, the Qatar National Research Fund, the Whitaker Foundation and industry. He has received an Alfred P. Sloan Fellowship and is a Fellow of the AIMBE. He has served as Chair of the Council of Chairs of Biomedical Engineering and Bioengineering Programs in the U.S.A.

Hitoshi Hirata, M.D. and PhD

Professor of Department of Hand Surgery
Professor of Innovative Research Center for Preventive Medical Engineering
Department of Hand Surgery
Nagoya University Graduate School of Medicine

Hitoshi Hirata, MD, PhD, is professor in the Graduate School of Medicine and holds a joint appointment in the Innovative Research Center for Preventive Medical Engineering, Nagoya University, Japan. He serves as Director of the Department of Hand Surgery, Nagoya University School of Medicine and Nagoya University Hospital. Dr.

Hirata received his medical degree in 1982 from Mie University School of Medicine and has been a visiting clinician at the Mayo Clinic. He is Congress President of the Japanese Society for Surgery of the Hand 60th Annual Meeting to be held in Nagoya from April 26–29, 2017 and chairs the International Symposium on Intelligent Functional Reconstruction of the Hand that will be convened simultaneously. Professor Hirata's research is within the broad area of functional reconstructive surgery with a focus on peripheral nerve surgery and regenerative medicine. He collaborates with researchers in robotics, neuroscience, rehabilitation medicine, plastic surgery and allied fields on the development of technology for stem cell-based functional reconstruction and neuroprosthetics and has worked extensively with the Japan Agency for Medical Research and Development, the Japan Society for the Promotion of Science, and the Japanese Ministry of Health, Labour and Welfare.

Jonathan Wolpaw, M.D. and PhD

Laboratory Chief and Professor.
Wadsworth Center.
New York State Dept of Health and State. Univ of New York

Over the past 30 years, Dr. Wolpaw's laboratory has developed and used operant conditioning of spinal reflexes as a model for defining the plasticity underlying learning. His group's recent work shows that reflex conditioning can guide spinal cord plasticity in spinal cord-injured rats and can thereby improve locomotion. Clinical researchers are now finding evidence that such conditioning can improve locomotion in people with partial spinal cord injuries. For the past 20 years, Dr. Wolpaw's laboratory has also developed EEG-based brain-computer interface (BCI) technologies to provide non-muscular communication and control to people who are paralyzed. Most recently, his group has begun to provide BCI systems to severely disabled people for daily use in their homes.

John C. Rothwell, M.D. and PhD
Physiology and Pathophysiology of Human Motor Control
Sobell Department of Motor Neuroscience and Movement Disorders
Institute of Neurology
University College London

Prof. Rothwell is full professor in the "Sobell Department of Motor Neuroscience and Movement Disorders" and head of the "Physiology and Pathophysiology of Human

Motor Control" laboratory. The Sobell department provides a world-class base for neurophysiological research into movement control and its disorders. Rothwell's laboratory has a leading position in the investigation of the human motor physiology. His main area of interest is transcranial magnetic stimulation and motor control and he has pioneered the use of the paired-pulse stimulation technique for interhemispheric studies. He has written over 600 papers and numerous book chapters.

Xavier Navarro, M.D. and PhD
Department of Cellular Biology, Physiology and Immunology
Institut de Neurociències
Faculty of Medicine
Universitat Autònoma de Barcelona (UAB)

Xavier Navarro received the MD degree in 1978 and the PhD degree in 1985 both from the Universitat Autònoma de Barcelona (UAB). He completed his specialty training in Neurology at the University of Barcelona, and in Neurophysiology at the University of Minnesota. He was Assistant Professor of the Department of Neurology of the University of Minnesota (1986-1988). He returned in 1988 to the UAB as Associate Professor in the Department of Cell Biology and Physiology, where he is currently full Professor of Physiology from 1999. He is the director of the Department of Cell Biology, Physiology and Immunology since 2010. He was a founder of the Institute of Neurosciences of the UAB. He also serves as scientific advisor of the Institut Guttmann of Neurorehabilitation.

He has published more than 300 papers in refereed journals and books, with an H index of 44, and directed 22 PhD theses. He has been member of the editorial boards of the journals: Restorative Neurology and Neuroscience, Journal of the Peripheral Nervous System, Muscle and Nerve, Frontiers in Neuroengineering. He has received the awards "Ciutat de Barcelona" in 1995, "Josep Trueta" in 2000, and ASPAYM award in 2009 for his scientific research activities.

AWARDS

Student Award "BEST STUDENT CONTRIBUTION"

Sponsored by IUVO S.r.l.

Committee:

Metin Akay, *University of Houston, USA*
Marco Molinari, *Fondazione Santa Lucia, Italy*
Jose L. Pons, *Cajal Institute, CSIC, Spain*
Dario Farina, *University Medical Center Göttingen, Germany*
Conor Walsh, *Wyss Institute at Harvard University*

Finalists:

15. Juliet Haarman, Jasper Reenalda, Piet Lammertse, Jaap Buurke, Herman van der Kooij and Hans Rietman. User acceptance of a balance support system that enables unsupervised training of balance and walking in stroke survivors

49. Subaryani Dambawati Harjaya Soedirdjo, Babak Afsharipour, Paolo Cattarello and Roberto Merletti. Introduction to EMG for the study of movement: From bipolar to high-density

63. Susan Aliakbaryhosseinabadi, Vladimir Kostic, Aleksandra Pavlovic, Sasa Radovanovic, Dario Farina and Natalie Mrachacz-Kersting. Effect of Attention Variation in Stroke Patients: Analysis of Single Trial Movement-Related Cortical Potentials

75. Asier Aguado, Igor Rodriguez, Elena Lazkano and Basilio Sierra. Supervised+Unsupervised Classification for Human Pose Estimation with RGB-D images: a first step towards a rehabilitation system

99. Alejandro Bachiller, Javier Gomez-Pilar, Jesús Poza, Pablo Nuñez, Carlos Gómez, Alba Lubeiro, Vicente Molina and Roberto Hornero. Event-Related Phase-Amplitude Coupling: a comparative study

105. Mario Widmer, Andreas Luft and Kai Lutz. Processing of Motor Performance related Reward after Stroke

164. Domenico Buongiorno, Francesco Barone, Denise J. Berger, Benedetta Cesqui, Vitoantonio Bevilacqua, Andrea d'Avella and Antonio Frisoli. Evaluation of a pose-shared synergy-based isometric model for hand force estimation: towards myocontrol

201. Francisco Resquin, Jose Gonzalez, Jaime Ibáñez, Iris Dimbwadyo, Susana Alves, Laura Torres, Laura Carrasco, Fernando Brunetti and José Luis Pons. Hybrid Robotic System for Reaching Rehabilitation after Stroke: reporting an usability experimentation

231. Rafael Mendoza, Rogelio Soto and Jose Luis Pons. Velocity dependant spasticity detection for Active Exoskeleton based therapies

252. Cosima Prahm, Benjamin Paaßen, Alexander Schulz, Barbara Hammer and Oskar Aszmann. Transfer Learning for Rapid Re-calibration of a Myoelectric Prosthesis after Electrode Shift

POSTER SESSION

P63. Susan Aliakbaryhosseinabadi, Vladimir Kostic, Aleksandra Pavlovic, Sasa Radovanovic, Dario Farina and Natalie Mrachacz-Kersting, **Effect of Attention Variation in Stroke Patients: Analysis of Single Trial Movement-Related Cortical Potentials.**

P55. Luca Tonin, Andrea Cimolato and Emanuele Menegatti, **Do Not Move! Entropy Driven Detection of Intentional Non-Control during Online SMR-BCI Operations.**

P234. Thomas Nørgaard Nielsen, Johannes J. Struijk and Cristian Sevcencu, **Stimulation Waveforms for the Selective Activation of Baroreceptor Nerve Fibers in the Cervical Vagus Nerve**

P271. A. Margherita Castronovo, Natalie Mrachacz-Kersting, Fabiano Landi, Helle R. Jørgensen, Kaare Severinsen and Dario Farina, **Motor Unit Coherence at Low Frequencies Increases together with Cortical Excitability following a Brain-Computer Interface Intervention in Acute Stroke Patients**

P129. Antonio Madrid, Verónica Robles-García, Yoanna Corral-Bergantiños, Josep Valls-Solé, Antonio Oliviero, Javier Cudeiro and Pablo Arias, **Response of spinal excitability to different short-lasting motor tasks: preliminary results.**

P50. Paolo Cattarello, Subaryani Dambawati Harjaya Soedirdjo, Babak Afsharipour and Roberto Merletti, **Effect of electrode size on amplitude estimation of HDsEMG maps.**

P105. Mario Widmer, Andreas Luft and Kai Lutz, **Processing of Motor Performance related Reward after Stroke.**

P195. Florin Dzeladini, Auke Ijspeert, Amandine Grappe, Amy Wu and Cole Simpson, **Muscle activation variability is inversely correlated with walking speed.**

P165. Andrew J. T. Stevenson, Svend S. Geertsen, Jens B. Nielsen and Natalie Mrachacz-Kersting, **Spatial facilitation of reciprocal inhibition and crossed inhibitory responses to soleus motoneurons during walking.**

P25. Uriel Martinez, Imran Mahmood and Abbas A. Dehghani-Sanij, **Probabilistic locomotion mode recognition for control of lower limb wearable soft robotics.**

P41. Luis Javier Monge Chamorro, Cecilia E. Garcia Cena and Marie Andre Destacar Eguizabal, **Simulation of Rehabilitation Therapies for Brachial Plexus Injury under the Influence of External Actuators.**

P44. Leila Alizadeh Saravi, Sung-Jae Lee and Dohyung Lim, **Effects of Balance Training with Resistance Function on Center of Mass Trajectory and Muscle Co-contraction.**

P64. Ki Hun Cho and Won-Kyung Song, **Relation between functional movement and kinematics in robot assisted reach exercise for chronic stroke survivors.**

P114. Neha Lodha, Agostina Casamento-Moran and Evangelos Christo, **Motor Control Training Enhances Reactive Driving in Stroke.**

P148, Miguel A. Velasco, Beatriz Valle, Rafael Raya, Alejandro Clemotte, Ramón Ceres, M. **Gloria Bueno and Eduardo Rocon, BiMU – Inertial sensors and virtual reality games for the rehabilitation of the upper limb in cerebral palsy.**

P183. Andrew Scheidler, Alif Tisha, Dominique Kennett-Hopkins, Yvonne Learmonth, Robert Motl and Citlali Lopez-Ortiz, **Targeted Dance Program for Improved Mobility in Multiple Sclerosis.**

P219. Arturo Bertomeu-Motos, Irene Delegido, Santiago Ezquerro, Luis D. Lledó, Jose M. Catalan and Nicolas Garcia-Aracil, **Upper-limb Motion Analysis in Daily Activities Using Wireless Inertial Sensors**

P38. Bas de Kruif, Leonard O'Sullivan, Emilio Schmidhauser and Konrad Stadler, **Reflex response modelling of exoskeleton-user interaction.**

P79. Andrej Olenšek, Matjaž Zadravec, Nika Goljar and Zlatko Matjačić, **Adaptation of Stepping Responses During Perturbed Walking in Neurologically Impaired Subject.**

P111. Subhasis Banerji, John Heng, Alakananda Banerjee, P S Ponvignesh, Daphne Menezes and Robins Kumar, **Delivering remote rehabilitation at home: An integrated physio-neuro approach to effective and user friendly wearable devices.**

P7. Marisol Rodríguez-Ugarte, Álvaro Costa, Eduardo Iáñez, Andrés Úbeda and José M. Azorín, **Pseudo-online detection of intention of pedaling start cycle through EEG signals.**

P19. Ren Xu, Brendan Z. Allison, Danut C. Irimia, Arnau Espinosa, Alexander Lechner and Christoph Guger, **How Many EEG Channels Are Optimal for a Motor imagery based BCI for Stroke Rehabilitation?**

P107. Denis Delisle Rodriguez, Ana Cecilia Villa Parra, Alberto López-Delis, Teodiano Bastos, Anselmo Frizera Neto and Eduardo Rocon, **Non-Supervised Feature Selection: Evaluation in a BCI for Single-Trial Recognition of Gait Preparation/Stop.**

P124. Fabio Ricardo Llorella Costa, Gustavo Patow and José M. Azorín, **Spectral Entropy and Vector Machines Support For Imagined Motion Detection In Brain-Computer Interfaces.**

P153. Andrea Sarasola-Sanz, Eduardo Lopez-Larraz, Nerea Irastorza-Landa, Julius Klein, David Valencia, Aitor Belloso, Fabrice Morin, Martin Spueler, Niels Birbaumer and Ander Ramos-Murguialday, **An EEG-based brain-machine interface to control a 7-degrees of freedom exoskeleton for stroke rehabilitation.**

P199. Alex Zervudachi, Eric Sanchez and Tom Carlson. **Preliminary EEG Characterisation of Intention to Stand and Walk for Exoskeleton Applications**

P260. Aitor Martínez, Jaime Ibáñez, Francisco Resquín and José Luis Pons. **Task influence on motor-related cortical signals: Comparison between upper and lower limb coordinated and analytic movements.**

P62. Navid Shirzad and H. F. Machiel Van der Loos, **An Empirical Study of Factorization Methods to Quantify Motor Synergies.**

P146. Andrés Úbeda, Massimo Sartori, Antonio J. Del-Ama, Ángel Gil-Agudo, Jose M. Azorin and Dario Farina, **Decoding muscle excitation primitives from slow cortical potentials during knee flexion-extension.**

P232. Cosima Prahm, Fares Kayali, Agnes Sturma and Oskar Aszmann, **Recommendations for Games to Increase Patient Motivation during Upper Limb Amputee Rehabilitation.**

P1. Taisuke Sakaki, Toshihiko Shimokawa, Nobuhiro Ushimi, Koji Murakami, Yong-Kwun Lee, Kazuhiro Tsuruta, Kanta Aoki, Kaoru Fujiie, Ryuji Katamoto and Atsushi Sugyo, **Rehabilitation Robot in Primary Walking Pattern Training for SCI Patient at Home.**

P17. Aitziber Mancisidor, Asier Zubizarreta, Itziar Cabanes, Pablo Bengoa and Je Hyung Jung, **A comprehensive training mode for robot-mediated upper limb rehabilitation.**

P37. Tommaso Proietti, Agnes Roby-Brami and Nathanael Jarrasse, **Learning motor coordination under resistive viscous force fields at the joint level with an upper-limb robotic exoskeleton.**

P61. Stephen Housley, David Wu, Samir Belagaje, Maysam Ghovanloo and Andrew Butler, **Improving Upper Extremity Impairments with Tongue Driven Robotic Assisted Rehabilitation: A Pilot Study.**

P81. Davide Scorza, Ana de Los Reyes - Gúzman, Camilo Córtes Acosta, Álvaro Bertelsen Simonetti, Aitor Ardanza Altube, Oscar Ruiz, Angel Gil and Julian Flórez, **Upper Limb Robot Assisted Rehabilitation Platform combining Virtual Reality, Posture Estimation and Kinematic Indices.**

P163. Jean Daly Lynn, Elaine Armstrong and Suzanne Martin, **User Requirements in Multimodal System Design and Robotics**

P257. Eduardo Piña-Martinez, Ricardo Roberts, Ernesto Rodriguez-Leal, Jose H. Flores-Arredondo and Rogelio Soto, **A Novel Exoskeleton for Continuous Monitoring of the Upper-Limb During Gross Motor Rehabilitation.**

P89. Pablo Viñas, Mar Hernández, Javier Pérez Turiel, Juan-Carlos Fraile, Alejandro Cuadrado, Rubén Alonso and Manuel Franco Martín, **Psychophysiological Measurements in a Robotic Platform for Upper Limbs Rehabilitation. First trials.**

P216. Teresa Martín Lorenzo, Sergio Lerma Lara, Cristina Bayón, Oscar Ramírez and Eduardo Rocon, **The CP Walker for Strength Training in Children with Spastic Cerebral Palsy: A training program proposal.**

P9. Takashi Watanabe, Shun Endo, Katsunori Murakami and Naomi Kuge, **A Preliminary Test of a Prototype of Portable Rehabilitation System Using FES Foot Drop Correction with a Hemiplegic Subject.**

P52. Jing Ye, Francisco Reyes and Haoyong Yu, **A Novel Robotic Walker for Over-ground Gait Rehabilitation.**

P57. Nina Lefeber, Eva Swinnen, Marc Michielsen, Stieven Henderix and Eric Kerckhofs, **Energy Consumption and Cardiorespiratory Load during Lokomat Walking Compared to Walking without Robot-Assistance in Stroke Patients: Preliminary Results.**

P245. Dennis Grasmücke, Oliver Cruciger, Renate Ch. Meindl, Thomas A. Schildhauer and Mirko Auch, **Experiences in four years of HAL exoskeleton SCI rehabilitation.**

P122. Pramod Chembrammel and Thenkurussi Kesavadas, **Control of a rehabilitation robot through brain computer interface using action grammar.**

P66. Bob Radder, Gerdienke Prange-Lasonder, Anke Kottink, Liesbeth Gaasbeek, Kristin Sletta, Johnny Holmberg, Thomas Meyer, Jaap Buurke and Hans Rietman, **Preliminary evaluation of a wearable soft-robotic glove supporting grip strength in ADL.**

P68. Bob Radder, Gerdienke Prange, Anke Kottink, Liesbeth Gaasbeek, Johnny Holmberg, Alejandro Melendez-Calderon, Jaap Buurke and Hans Rietman, **User acceptance of a therapeutic system that enables hand training exercises in a motivating environment.**

P185. Fabricio Lima Brasil, Alistair Campbell F McConnell, Marta Vallejo, David W Corne, Adam A Stokes, Patricia Amancio Vargas and Renan Cipriano Moioli, **Combining Soft Robotics And Brain-Machine Interfaces For Stroke Rehabilitation.**

P117. Marie André Destarac, Cecilia E. García Cena and Roque Saltarén Pazmiño, **Simulation of the Length Change in Muscles during the Arm Rotation for the Upper Brachial Plexus Injury.**

P189. Gil Serrancolí, Joris De Schutter and Friedl De Groote **Analysis of optimal control problem formulations in skeletal movement predictions**

P206. Massimo Sartori, Utku Yavuz, Cornelius Frömmel and Dario Farina, **From Spiking Motor Units to Joint Function.**

P235. Imran Mahmood, Uriel Martinez-Hernandez and Abbas A. Dehghani-Sanij, **Towards behavioral based sensorimotor controller design for wearable soft exoskeletal applications.**

P259. Houda Barbouch, Francisco Resquin and Jose Gonzalez, **Hybrid Robotic System Simulation for the exploration of novel control strategies.**

P88. Javier Pérez Turiel, Manuel Franco Martín, Juan Carlos Fraile Marinero, Esther Parra and Pablo Viñas, **First results on the joint use of E2Rebot and Gradior to improve cognitive abilities.**

P85. Daniel Simonsen, Erika G. Spaich and Ole K. Andersen, **Microsoft Kinect-based System for Automatic Evaluation of the Modified Jebsen Test of Hand Function.**

P184. Nora Millor, Marisol Gomez, Pablo Lecumberri, Alicia Martinez-Ramirez, Jon Martiricorena and Mikel-Izquierdo, **Chair kinematics, an improvement in frailty status classification.**

P213. Patricio Barria, Asterio Andrade, Andre Moris and Eva Tapia, **Gait exercise program with a low-tech device for children with severe cerebral palsy: physiologic and neuromotor effects.**

P218. Sven Knuth, Arne Passon, Frank Dähne, Andreas Niedeggen, Ingo Schmehl and Thomas Schauer, **Adaptive Arm Weight Support using a Cable-Driven Robotic System**

P209. Eric Kerckhofs and Natacha Deroost, **The effect of anodal transcranial direct current stimulation (tDCS) on sequential motor skill learning in persons with Parkinson's disease.**

P227. Jeremia Held, Bart Klaassen, Bert-Jan van Beijnum, Andreas Luft and Peter Veltink, **The Evaluation of Feedback Modalities in Stroke Survivors.**

P241. Elvira Pirondini, Tomislav Milekovic, David Borton, Jean Laurens, Erwan Bézard, Silvestro Micera and Gregoire Courtine, **High-accuracy decoding of leg kinematics and muscle activity from local field potentials during locomotion in non-human primates**.

P243. Jeremia Held, Bart Klaassen, Albert Eenhoorn, Jaap Buurke, Bert-Jan van Beijnum, Peter Veltink and Andreas Luft, **Monitoring stroke patients in hospital and home environment**.

P266. B. Valladares, J. P. Held, M. Branscheidt, L. Steiner, P. A. Celnik, T. Kitago, J. W. Krakauer, and A. R. Luft. **SMARTS 2 – Study of Motor learning and Acute Recovery Time course in Stroke**

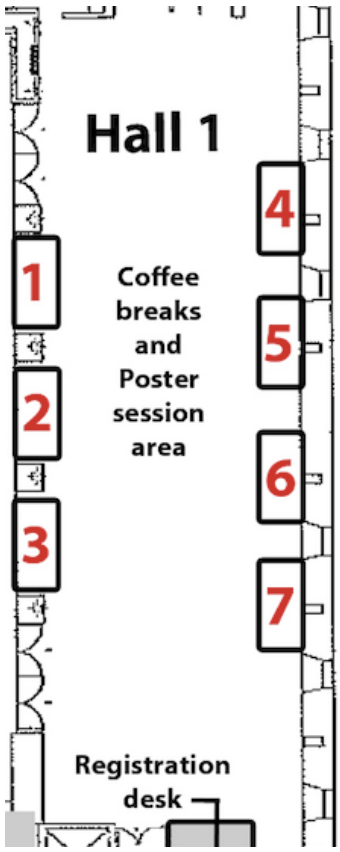
P170. Tycho Brug, Florin Dzeladini, Amy Wu and Auke Ijspeert. **Combining a 3D reflex based neuromuscular model with a state estimator based on central pattern generators**

P281. Fredy Hanna and Joaquin Alfonso **Top 50 cited articles in Neurorehabilitation by Transcranial Magnetic Stimulation: A Bibliometric Analysis**

P76. Cristopher Ávila, Luis Manso Fernández-Argüellez, Pablo Bustos and Pedro Núñez. **VRComponent': a Virtual Reality Software for Neuro-rehabilitation with Robotics**

P116. Marco Capogrosso, Gregoire Courtine, Silvestro Micera, Erwan Bezard and Jocelyne Bloch. **A Computational Framework for the Design of Spinal Neuroprostheses**

EXHIBITOR PLAN



Platinum Sponsors (Floor 1):

Booth 1 – Ekso Bionics
Booth 2 – CSIC
Booth 3 – Techno Concept
Booth 4 – Gogoa
Booth 5 – Neuroelectrics
Booth 6 – OSSUR
Booth 7 – Technaid & La Salle University

Gold Sponsor (Floor -1):

Booth 8 – Brain Products

Silver Sponsors (Floor -1):

Booth 9 – GTEC
Booth 10 – Springer
Booth 11 – CARTIF
Booth 12 – Ant neuro
Booth 13 – Miguel Hernandez University
Booth 14 – European Research Projects

THANKS TO OUR SPONSORS

Platinum Sponsors

Gold Sponsor

Silver Sponsors