1st IFAC Conference
on Cyber-Physical&Human-Systems
7-9 December 2016, Florianopolis, Brazil   www.cphs2016.org

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Conference Report
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Preface

Following the great success of the workshop H-CPS-I : Human-Cyber-Physical System Interaction: Control for Human Welfare, in Paris, 2014, highly supported by the IEEE CSS Outreach Fund, the conference CPHS 2016's aim has been to continue and make grow this action that the organisers considered of high importance for the future of technological developments to improve humans lives. The goal has been to increase the action initiated in H-CPS-I 2014 in order to consolidate an international world-wide scientific community interested and working on the topic.

The 1th IFAC Conference on Cyber-Physical&Human-Systems (CPHS 2016) was held from December 7-9, 2016 at the Majestic Hotel, Florianopolis, Brazil. CPHS 2016 has received the precious support from the IEEE Control Systems Society Outreach Fund (IEEE CSS), that has co-sponsored the event. In addition to the main sponsorship by IFAC, also the following organisations have co-sponsored CPHS 2016: the US National Science Foundation (NSF), the French Institute for Science and Technology of Transport, Development and Networks (IFSTTAR), the National Center for Scientific Research in France (CNRS), the French Research Group Modeling, Analysis and Control of Dynamic Systems (GDR MACS), the European Embedded Control Institute (EECI), the Post-Graduation in Automation and Systems Engineering Program of the Federal University of Santa Catarina (UFSC) and the Institute for Control and Decision of Paris Saclay (iCODE). The conference has been co-sponsored by eleven IFAC Technical Committees (the TCs 9.2, 1.3, 1.4, 1.5, 3.1., 3.3, 4.3, 4.5, 7.3, 7.4, 8.2, 9.5)

We deeply thank the IEEE CSS Outreach for the precious support given to the conference. Indeed, the IEEE CSS Outreach support has been of fundamental importance to allow the realization of this important event. We would like also to kindly and very deeply thank the IEEE CSS Outreach chair, Dr. Daniel Rivera, for his precious presence and support given all through the conference construction. Daniel, Infinite Thanks!

Contents

I - MOTIVATION

Cyber-Physical Systems have strongly impacted society and have huge potential for new impacts and improvements in citizens' lives in the future. This is true in several application domains where control theory and technology have a central role. New healthcare technologies, new transportation services coupled with new concepts for improving the mobility of citizens, new energy delivery methods that empowers customers' choice are some examples. Further new potential societal benefits from automation are yet to be precisely identified. The barriers in control that need to be circumvented to achieve these benefits need deep investigation. An example is the huge potential progress in robotic surgery as highlighted in the [H-CPS-I event](). On the other hand, possible non-desirable effects need to be identified in parallel sufficiently far in advance such that investigation and proper actions can be made to avoid problems. Indeed, deeper ethical and philosophical discussions on what are the frontiers of technology/control and human interaction constitute a fundamental topic. What are the choices on which tasks/decisions only technology/control should do? What can (should) only be done/decided by a human being? We have talked about the Human-CPS systems and its benefits, but where only is the machine involved and which cases represent the domain for human concern only?

For studying answers to such questions, it is imperative to widely exchange between different specialists, and that's why we decided to pursue, widen and make grow the H-CPS-I action by the construction of CPHS 2016.

II - MAIN GOALS AND CONFERENCE STRUCTURE

The main goal of CPHS 2016 was to construct a place of scientific exchanges on Cyber-Physical&Human-Systems (CPHS) in order to discuss technical challenges and the prospective on CPHS to give continuation to the important action we began in the workshop H-CPS-I. The foundation for this was to construct a meeting able to break the barriers between disciplines and application domains gathering complementary communities. This goal has been fully achieved, and has been very much appreciated by the participants. Indeed, the participants have deeply exchanged in an incredibly pleasant, motivated and agreeable atmosphere.

We pursued in CPHS 2016 the structure created in the precedent event, the workshop H-CPS-I 2014 in Paris, considering the four main big families of interactions between Humans and CPS: human-machine symbiosis, humans as operators of complex engineering systems, humans as agents in multi-agent systems, humans as elements in controlled systems.

In CPHS 2016, different application areas (healthcare, robotics, operation in hazardous environments, transport - ground (automotive, railway), air, space, etc) have been considered, according to four scenarios, as follows :

1. Human-Machine Symbiosis
   – Smart prosthetics, exoskeletons
   – Neurostimulation, biomedical implants

2. Humans as operators of complex engineering systems
   – Aircraft control, Human-Machine interaction in aircraft
   – Automotive cooperated control (ADAS, etc)
   – Process plant operation
   – Robotic surgery
   – Spacecraft control
   – Control in hazardous environments
   – Automated or semi-automated trains
   – Remote operation of robotic teams e.g. in rescue scenarios

3. Humans as agents in multi-agent systems
   – Intelligent road transportation, next-generation air traffic management
   – Flexible manufacturing, assistive robotics
   – Smart Grid and Demand Response

4. Humans as elements in controlled systems
   – Comfort control in homes, Connected buildings
   – Smart cities
   – Rescue robotics
   – Assistive devices
   – Smart infrastructure

and in all the above topics:
   – Semiautonomous and mixed-initiative systems
   – Shared control
   – Cognitive control
   – Decision-support for human operators
   – Recent theoretical developments impacting the open problems
   – Ethics and public policy, Potential impact and open problems, ...

Note : The colors are a tentative "measure" of the level of interaction of the Cyber-Physical System with the human being **red :** strong interaction; **orange:** medium; **green:** light interaction).

III- PARTICIPATION

CPHS 2016 has attracted:

- ✓ Submissions from 16 countries,
- ✓ Authors and co-authors of accepted papers from 14 countries, and
- ✓ Participants from 9 countries.

The top countries are listed below:
I - Brazil:	29 authors,	45 participants
II - Russia:	26 authors,	8 participants
III - France:	23 authors,	17 participants
IV - Germany:	23 authors,	8 participants
V - USA :	19 authors,	12 participants
VI - China:	6 authors,	3 participants

and also authors and/or participants from: Spain, Austria , New Zeland, The Netherlands, UK, Colombia, Mexico, Australia.

Industry participation has been introduced by plenary speakers of scientific excellence:

1. plenary talk from Petr Stluka, HONEYWELL, Tchèque Republic, on 'New challenges for advanced control in connected buildings';
2. plenary talk from Gérard Roucairol former scientific director of BULL and president of TERATEC, France on 'High Performance Computing: Breakthroughs and Challenges'.
3. The plenary talk from Sebastien Engell, TU Dortmund, describing results obtained with INEOS 'Operator support for improving resource efficiency in chemical plants'.

IV - EVENT DESCRIPTION AND SUMMARY OF THE CONFERENCE CONTENTS

Figure 1: Some CPHS 2016 lively moments of exchanges.

The scientific contents of the conference have been pertinent and presented in excellent motivated presentations, as described in the following. CPHS 2016 counted 6 plenary talks covering the four main topics described above, 43 accepted papers organized in eight - four regular and four invited - sessions, one tutorial session, two prospective panel discussions and one poster session with the presentation of posters and prototypes. With approximately 38% of students registrations, CPHS 2016 has also brought these new discussions to the younger scientific community. The National Science Foundation (NSF) in US has sponsored the travel of 10 US students to Brazil to attend CPHS 2016. C. Wiesener, PhD student at TU Berlin has been awarded for his work "Robust Discrimination of Flexion and Extension Phases for Mobile Functional Electrical Stimulation (FES) Induced Cycling in Paraplegics".

The CPHS 2016 General Chair has been Dr. M. Netto (IFSTTAR, France). The Program Chair has been Prof. S. Spurgeon (UCL, UK). The NOC Chair has been Prof. U. F. Moreno (UFSC, Brazil), the NOC Co-Chair, Prof. N. Roqueiro (UFSC, Brazil) and the Editor, Prof. L. Becker (UFSC, Brazil). The conference steering committee has been composed by: Prof. A. Annaswamy (MIT, US), Prof. S. Hirche (TU Munchen, Germany), Dr. F. Lamnabhi-Lagarrigue (CNRS-L2S, EECI, France), Prof. W. Perruquetti (Ecole Centrale de Lille, France) and Dr. T. Samad, Honeywell, US. The IPC consisted of 35 members of 17 countries.

The conference has been opened by the NOC Chair Prof. U. F. Moreno and by the CPHS 2016 General Chair Dr. M. Netto. Prof. U. Moreno has welcomed the participants with beautiful words on the human-to-machine but also on the human-to-human interactions. Dr. Mariana Netto confronted human skills from the past with a prospective future, highlighting some of the very beautiful new potential benefits from technology to humans, and also the main challenges, open questions and ethical issues related to CPHS that in her opinion shall be carefully considered.

The CPHS 2016 program included 6 plenary talks by the internationally-recognized scientists:

Prof. Sébastien Engell
TU Dortmund, Germany
Operator support for improving resource efficiency in chemical plants

Dr. Franck Mars
IRCCyN - Ecole Centrale de Nantes, France
A cybernetic driver model to support steering control assistance and distraction monitoring

Prof. Bérénice Mettler
University of Minnesota, US
Where humans and machines meet: systematic modeling of human-machine systems

Dr. Gérard Roucairol
Académie desTechnologies, France
Chevalier de la Légion d'honneur, Chevalier de l'ordre national du Mérite
Digital infrastructure evolution: breakthroughs, challenges and impacts on society

Dr. Petr Stluka
Honeywell, Prague, Czech Republic
New challenges for advanced control in connected buildings

Prof. Frédéric Vanderhaegen
University of Valenciennes and of Hainaut-Cambrésis, France
Human reliability and Cyber-Physical&Human-Systems (CPHS)

The two panel discussions have raised deeply engaged and very agreeable and motivated discussions. The first one entitled:

CPHS in Transportation: discussion on needs, challenges, advances & prospective - 3 countries cases: Brazil, France and China, had as panellists:

Prof. W. Kraus (UFSC, Brazil), Dr. J.-P. Lebacque, Dr. H.-H. Salem and Dr. J.-M. Burkhardt (IFSTTAR, France) and Prof. H. Sun (Univ. TongJi, Chine) and has been chaired by Dr. G. Roucairol (TERATEC, France).

The second one entitled:

CPHS: evolution, potential impacts and prospective - from an interdisciplinary view, had as panellists:

Dr. G. Roucairol, Prof. F. Vanderhaegen, Prof. B. Mettler, Dr. T. Schauer (TU Berlin) and Dr. P. Carvalho (IEN, Brazil) and has been chaired by Prof. S. Engell.

The four invited sessions have raised up discussions on the following topics :

1. Smart cyber-physical systems for restoring human movement after paralysis
2. Smart control mechanisms in complex systems
3. CPHS in transportation: from humans to autonomous traffic management
4. Pilot vehicle system analysis and design

And the four regular sessions:

1. Human & CPS,
2. Human operators,
3. Industrial processes and
4. Robotics.

The conference has been closed with a full room by the beautiful and very pertinent Tutorial, given by:

> [Bruno Berberian](#)
> *The French Aerospace Lab – Human System Integration Group*
> **My brain is out of the loop : a neuroergonomic approach of the**
> **Out of The Loop (OOTL) phenomenon**

V - IEEE CSS Outreach support

We are very grateful, as we mentioned, to the IEEE CSS Outreach support that has been indeed fundamental to allow the launching of this new series of events.

The accorded support by the IEEE CSS Outreach has been USD 8 000,00 USD (eight thousand dollars). This support has been used for the conference rooms rental and food & beverages expenses for the three event days, which total cost has been USD 9 795,00 USD **. The total eligible cost related to the outreach fund proposal is then USD 9795,00 with only items previously agreed by the IEEE CSS Outreach. Since the amount is larger than the amount in the proposal we would like to claim the whole USD 8,000 amount.

** equivalent to BRL 31 010,00 with the exchange rate 1USD = 3,166 BRL on August 30, 2017.

VI- PUBLICATIONS

The event proceedings have been published on IFAC PapersOnline
A Special Section on CPHS will appear in Annual Reviews in Control, in the coming Fall Issue 2017.

VII - SOCIAL PROGRAM

The social program has been very intense. The conference started with the welcome reception on the evening of the 1st day of the event in the Majestic Hotel. The Gala Dinner has been on the second day of the event and the participants have been driven from the Conference venue through the Florianopolis Island to a very pleasant restaurant by the side of the Lagoa da Conceição in Florianopolis. The diner with local specialities was served with in-live music and with tasteful wine. The conference has been closed by a very agreeable and tasteful farewell reception on Friday night December 9th in the Majestic Hotel.

VIII - OVERALL ASSESSEMENT

CPHS 2016 has been a very fruitful, charming, lively and successful event, with participants from throughout the Globe, in a very pleasant human atmosphere and within the beauty of Florianopolis.
We are very proud and happy of what we have accomplished. The CPHS 2016 main goal that was the construction of a motivated (multi-disciplinary) scientific community on the CPHS topic, has been fully achieved and, as mentioned, in a very pleasant athmosphere. Also, the desired goal of constructing an event at the same time technical and open-minded and for this exchanging on a wide range of application domains and disciplines, has been fully achieved, a feature that has been very much appreciatted by the participants.

The CPHS 2016 scientific contents have been pertinent and presented in excellent motivated presentations. The plenaries, of excellent quality, have been given by reknown speakers. The two panel discussions allowed cross-disciplines and cross-country needs discussions and have raised deep engaged discussions - the panelelists were indeed very happy in their roles and the discussions very friendly and agreable could have lasted longtime....The Tutorial session on Neuroergonomics that has been the final speech of the conference on the evening of December 9th, assisted by approximately 50 participants, has been indeed very pertinent and a very beautiful talk to wrap up CPHS 2016. Paradoxally, the

small/medium size of the event resulted in many rich exchanges between the participants. New discussions and collaborations have been created from CPHS'16. The group has been very happy to be together exchanging on the CPHS topic.

IX - FUTURE WORKS AND PERSPECTIVES

The 2nd CPHS 2018, will be co-leaded by the international control leaders, Prof. Anuradha Annaswamy, MIT (General Chair), Prof. Dawn Tilbury, Univ Michigan (General Chair), and Prof. Sandra Hirche TU Munchen (Program Chair) and will be held in the USA, Miami, in December 2018.

X - ACKNOWLEDGMENTS

The organisers deeply thank IEEE, the IEEE CSS Outreach Fund and thank very kindly its chair, Dr. Daniel Rivera. We also thank very kindly the IFAC sponsoring and all the co-sponsoring organisations for their precious support that allowed the conference to be constructed. We deeply thank in the same way all the eleven IFAC co-sponsoring technical committees, the NOC and all colleagues for their dedication to make happen the 1st CPHS 2016 such a successful event.

by Mariana Netto, CPHS 2016 General Chair

XI- ANNEX: WORKSHOP PROGRAM (next pages)

PROGRAM AT A GLANCE

	Wednesday December 7	Thursday December 8	Friday December 9
8:00 - 8:20		**Plenary Session III** **Bérénice Mettler** **Where humans and machines meet: systematic modeling of human-machine systems**	
8:20 - 8:40			
8:40 - 9:00	**Welcome & on-site registration**	**Regular session II** **Human Operators (4 p)**	
9:00 - 9:20			**Plenary Session VII** **Homayoon Kazerooni** **New developments on lower extremity exoskeleton systems**
9:20 - 9:40	**Introduction** Mariana Netto & Ubirajara Moreno		
9:40 - 10:00	**Plenary Session I** Petr Stluka **New challenges for advanced control in connected buildings**		**Invited session IV - 1** **Smart Cyber-Physical Systems for restoring human movement after paralysis - 1 (2 p)**
10:00 - 10:20			
10:20 - 10:40	**10:20 - 10:40** **Coffee break**	**10:20 - 10:40** **Coffee break**	**10:20 - 10:40** **Coffee break**
10:40 - 11:00	**Invited Session I** **Smart control mechanisms in complex systems (6 p)**	**Plenary Session IV** **Sebastian Engell** **Operator support for improving resource efficiency in chemical plants**	**Invited session IV - 2** **Smart Cyber-Physical Systems for restoring human movement after paralysis - 2 (4 p)**
11:00 - 11:20			
11:20 - 11:40			
11:40 - 12:00		**Regular session III** **Industrial Processes (4p)**	
12:00 - 12:20			**Open Panel II** **CPHS: evolution, potential impacts and prospective - from an interdisciplinary view**
12:20 - 12:40			
12:40 - 13:00	**12:40 - 14:00** **Lunch**		
13:00 - 14:00		**13:00 - 14:20** **Lunch**	**13:00 - 14:20** **Lunch**
14:00 - 14:20	**Plenary Session II** **Gérard Roucairol** **High performance computing: breakthroughs and challenges**		
14:20 - 14:40		**Plenary Session V** Franck Mars **A cybernetic driver model to support steering control assistance and distraction monitoring**	
14:40 - 15:00	**Regular session I** **Human & CPS (5p)**		**Regular session IV** **Robotics (6p)**
15:00 - 15:20		**Invited Session III** **Pilot vehicle system analysis and design - 1 (3p)**	
15:20- 15:40			
15:40 - 16:00			
16:00 - 16:20		**16:00- 16:20** **Coffee Break**	
16:20- 16:40	**16:20- 16:40** **Coffee Break**	**Invited Session III** **Pilot vehicle system analysis and design - 1 (2p)**	**16:20- 16:40** **Coffee Break & Award**
16:40 - 17:00	**Invited Session II** **CPHS in transportation: from humans to autonomous traffic management (5 p)**		**Tutorial session I** **Bruno Berberian** **My brain is out of the loop: a neuroergonomic approach of the Out of The Loop (OOTL) phenomenon**
17:00 - 17:20		**Plenary Session VI** Frédéric Vanderhaegen **Human reliability & CPHS**	
17:20 - 17:40			
17:40 - 18:00		**Demos/posters session I**	
18:00 - 18:20			
18:20 - 18:40	**Open Panel I** **CPHS in Transportation: discussion on needs, challenges, advances & propective - 3 countries cases : Brazil, France, China.**		**Farewell Reception**
18:40 - 19:00			
19:00 - 19:20			
19:20 - 19:30			
19:30 - 20:30	**Welcome Reception**	**Gala dinner & Social Event**	
20:30 - 21:00			
21:00 - 22:30			

Wednesday 7 December 2016

8:40 – 9:20	**Welcome & on-site registration**
9:20 – 9:40	**Introduction** Mariana Netto & Ubirajara Moreno
9:40 – 10:20	**Plenary Session I: New challenges for advanced control in connected buildings, Petr Stluka, Honeywell, Prague, Czech Republic**
10:20 – 10:40	*Coffee break*
10:40 – 12:40	**Invited Session I: Smart Control Mechanisms in Complex Systems**
10:40 – 11:00	**Control Mechanisms for Organizational-Technical Systems: Problems of Integration and Decomposition,** Vladimir Burkov, Nikolay Korgin, Dmitry Novikov, *Trapeznikov Institute of Control Sciences & Moscow Institute of Physics and Technology, Russia.*
11:00 – 11:20	**Decision-Making Support Systems in Large-Scale Production Facilities,** Pashchenko F.F.[1], Durgarjan I.S.[1], Pashchenko A.F.[1], Kudinov Y.I.[2], [1] *Trapeznikov Institute of Control Sciences of Russian Academy of Sciences, Moscow, Russia and* [2]*Lipetsk State Technical University, Russia.*
11:20 – 11:40	**Gaming Experiments for Analysis of Pricing Mechanisms at Electricity Markets,** V. Chirkin[1], M. Goldstein[1], A. Gorbunov[1], M. Goubko[2], V. Korepanov[2], N. Korgin[2], T. Sayfutdinov[2], A. Sharova T. Vaskovskaya[2], [1]*Skolkovo Institute of Science and Technology,* [2] *Trapeznikov Institute of Control Sciences of Russian Academy of Sciences,Moscow, Russia.*
11:40 – 12:00	**Adding Informational Beliefs to the Players Strategic Thinking Model,** Alexander G. Chkhartishvili, Vsevolod O. Korepanov, *Trapeznikov Institute of Control Sciences of Russian Academy of Sciences, Moscow, Russia.*
12:00 – 12:20	**Bayesian Learning of Consumer Preferences for Residential Demand Response** Mikhail V. Goubko[1], [2], Sergey O. Kuznetsov[3], Alexey A. Neznanov[3], Dmitry I. Ignatov. [3] [1]*Trapeznikov Institute of Control Sciences of Russian Academy of Sciences, Moscow, Russia* [2] *Skolkovo Institute of Science and Technology, Moscow, Russia,* [3]*National Research University Higher School of Economics, Moscow, Russia*
12h20 – 12h40	**Optimal Control of a Climatization System Using Energy and Comfort Objectives,** Franklin D. Rincon[1], Bruno F. Santoro[2], Diego F. Mendoza[3], [1]*West Virginia University, US,* [2]*Federal University of São Paulo,Brazil,* [3]*Universidad Autonoma del Caribe, Colombia.*
12:40 – 14:00	*Lunch*
14:00 – 14:40	**Plenary Session II: High Performance Computing: Breakthroughs and Challenges, Gérard Roucairol,** TERATEC, President, and French Academy of Technologies, France.
14:40 – 16:20	**Regular Session I: Human & Cyber-Physical Systems**
14:40 – 15:00	**Toward a Petri Net Based Model to Control Conflicts of Autonomy between Cyber-Physical&Human-Systems,** F. Vanderhaegen, *University of Valenciennes, LAMIH CNRS, France.*
15:00 - 15:20	**Classification of human-robot team interaction paradigms**, Selma Music, Sandra Hirche, *TU München, Germany.*
15:20 – 15:40	**Real-Time Sensing of Trust in Human-Machine Interactions ?,** Kumar Akash, Wan-Lin Hu, Tahira Reid, Neera Jain, *School of Mechanical Engineering, Purdue University,US.*
15:40 – 16:00	**Scheduling Tasks for Human Operators in Monitoring & Surveillance,** Sai Krishna Kanth Hari, Kaarthik Sundar, Sivakumar Rathinam, Swaroop Darbha, *Texas A&M University, US.*
16:00 – 16h20	**Planning Operator Support in Cyber-Physical Assembly Systems**, Philipp Hold[1], Fabian Ranz[2], Vera Hummel[2], Wilfried Sihn[1], [1]*Technical University Vienna, Austria,* [2]*Reutlingen University, Germany.*
16:20 – 16:40	*Coffee break*
16:40 – 18:20	**Invited Session II: CPHS in transportation: from humans to autonomous traffic management**
16:40 – 17:00	**Simulation and virtual reality-based learning of non-technical skills in driving: critical situations, diagnostic and adaptation,** J-M. Burkhardt[1], V. Corneloup[1], C. Garbay[2], Y. Bourrier[2] F. Jambon[2], V. Luengo[3], A. Job[4], Ph. Cabon[4], A. Benabbou[5] ,D. Lourdeaux[5], [1]*IFSTTAR,* [2] *LIG-Laboratoire d'Informatique de Grenoble,* [3]*LIP6 – Université Pierre et Marie Curie, Sorbonne Universités,* [4]*LATI – Université Paris Descartes,* [5] *Heudiasyc, France.*
17:00 – 17:20	**Methodologies to assess usability and safety of ADAS and automated vehicle**, Annie Pauzie, Olivier Orfila, *IFSTTAR, France.*
17:20 – 17:40	**Reducing driver's behavioural uncertainties using an interdisciplinary approach: Convergence of Quantified Self, Autonomous Vehicles, Internet Of Things and Artificial Intelligence**.?, A. Rakotonirainy[1], O. Orfila.[2], D. Gruyer[2], [1]*Centre for Accident Research Road Safety (CARRS-Q) Queensland University of Technology,* France, [2]*IFSTTAR, France.*
17:40 – 18:00	**Performance Assessment of an Urbain Collective Cars System**, Jennie Lioris, Regine Seidowsky, Habib Haj-Salem, and Jean-Patrick Lebacque, *ISTTAR, France.*
18:00 – 18:20	**Cooperative Mainstream Traffic Flow Control on Freeways,** Eduardo R. Müller, Rodrigo C. Carlson, Werner Kraus Jr., UFSC, Brazil.
18:20 – 19:20	**Open panel: CPHS in Transportation: discussion on needs, challenges, advances & propective - 3 countries cases : Brazil, France, China.** W. Kraus[1], J.-P. Lebacque[2], J.-M. Burkhardt[2], H. Haj-Salem[2], Haihao Sun[3], [1]*UFSC, Brésil,* [2]*IFSTTAR, France,* [3]*TongJi Univ., China.*
19:30 – 21:00	**Welcome Reception**

Thrusday 8 December 2016	
8:00 – 8:40	**Plenary Session III: Where humans and machines meet: systematic modeling of human-machine systems, Bérénice Mettler,** Minneapolis, University of Minnesota, US.
8:40 – 10:20	**Regular Session II: Human Operators**
8:40 – 9:00	**Extraction and Deployment of Human Guidance Policies,** Andrew Feit and Berenice Mettler, *Minneapolis, University of Minnesota, US.*
9:00 – 9:20	**An Experimental Investigation on Human Spatial Control Skill Development ,** Bin Li and Bérénice Mettler, *Minneapolis, University of Minnesota, US.*
9:20 – 9:40	**Application of System Identification Techniques to Revealing Professional Skills of Teams of Human-Operators,** K.R. Chernyshov, *Trapeznikov Institute of Control Sciences, Moscow, Russia.*
9:40 – 10:00	**Investigating Human Learning and Decision-Making in Navigation of Unknown Environments,** Abhishek Verma and Berenice Mettler, *Minneapolis, University of Minnesota, US.*
10:00 – 10:20	**Resilience in Firefighting Emergency Response: Standardization and Resilience in Complex Systems,** Paulo Victor Rodrigues de Carvalho, *Instituto de Engenharia Nuclear, RJ, Brazil,* Jose Orlando Gomes, Angela Weber Righi, Gilbert Jacob Huber, *Feredal Univ. of Rio de Janeiro, Brazil.*
10:20 – 10:40	*Coffee break*
10:40 – 11:20	**Plenary Session IV: Operator Support for Improving Resource Efficiency in Chemical Plants, Sebastian Engell,** *TU Dortmund, Allemagne.*
11:20 – 13:00	**Regular Session III: Industrial Processes**
11:20 – 11:40	**Industrial Application of Multi-criterial Decision Support to improve the Resource Efficiency,** Daniel Ackerschott[1], Benedikt Beisheim[2], Stefan Kramer[2], Sebastian Engell[1], *[1]TU Dortmund, [2]INEOS Collogne, Allemagne.*
11:40 – 12:00	**A Framework to Evaluate the Integration of Operators in Nonlinear Model-Predictive Control of Chemical Processes**, C. Lindscheid, A. Bremer, D. Haßkerl, A. Tatulea-Codrean, S. Engell, *TU Dortmund, Allemagne.*
12:00 – 12:20	**An Emerging Industrial Business Model considering Sustainability Evaluation and using Cyber Physical System Technology and Modelling Techniques**, Edson H. Watanabe[1], Fabricio Junqueira, Diolino J. dos Santos Filho, Paulo E. Miyagi, *University of Sao Paulo, Sao Paulo, SP and [1]Federal Institute of Santa Catarina, Joinville, SC, Brazil.*
12:20 – 12:40	**Managing CPS Complexity: Design Method for Unmanned Aerial Vehicles,** Fernando S. Goncalves[1], Leandro B. Becker[1], Guilherme V. Raffo[2], [1]*UFSC, Florianopolis, [2]UFMG, Belo Horizonte, Brazil.*
12:40 - 13:00	**Big Data Refining on the Base of Cognitive Modeling,** Zinaida Avdeeva, *V.A. Trapeznikov Institute of Control Sciences of RAS, Russia,* Alexander Raikov, *Institute of Control Sciences RAS, Russia,* A.Ermakov, *3i Technologies, Russia.*
13:00 – 14:20	*Lunch*
14:20 – 15:00	**Plenary Session V: Human reliability and CPHS, Frédéric Vanderhaegen** , *LAMIH, Université de Valenciennes, France.*
15:00 – 16:00	**Invited Session III Pilot Vehicle System Analysis and Design - 1 (3p)**
15:00 – 15:20	**"Fast Simulation" in the Evaluation of Adaptive Pilot Performance and Aircraft Handling Qualities** , Ronald A. Hess, *University of California, Davis, CA, US.*
15:20 – 15:40	**Pilot behavior modeling and its application to manual control tasks**, A.V. Efremov[1], M.S. Tjaglik[1], U.V. Tiumentzev[1], Tan Wenqian[2], [1]*Moscow aviation Institute, Moscow, Russia and [2]Beijing University of Aeronautics and Astronautics, Beijing, China.*
15:40 – 16:00	**Effect of Feel System Characteristics on Pilot Model Parameters**, Larisa E. Zaychik, Kirill N. Grinev, Yury P. Yashin, Sergey A. Sorokin, *The Central Aerohydrodynamic Institute.*
16:00 – 16:20	*Coffee break*
16:20 – 17:00	**Invited Session III Pilot Vehicle System Analysis and Design - 2 (2p)**
16:20 – 16:40	**Operator Engagement During Prolonged Simulated UAV Operation**, Raphaëlle N. ROY, Angela Bovo, Thibault Gateau, Frédéric Dehais, Caroline P. Carvalho Chanel, *ISAE-SUPAERO, Space & Aeronautics Center, Toulouse, France.*
16:40 - 17:00	**Aircraft-Pilot System Modeling and Pilot Control Behavior Research for Airdrop Task,** Tan Wenqian, Li Zongyuan, Qu Xiangju, Wang Yanyang, Sun Liguo. *School of Aeronautic Science and Engineering, Beihang University, Beijing, China.*
17:00 – 17:40	**Plenary Session VI: A cybernetic driver model to support steering control assistance and distraction monitoring, Franck Mars,** *IRCCyN, CNRS & ECN, France.*
17:40 – 18:40	**Demos/posters track**
	Flight Control Performance of Autopilots and Human Pilots Following an Anomaly, Benjamin T. Thomsen and Anuradha M. Annaswamy, MIT, US.
	Project for Designing Autonomous Aerial Vehicles (Provant), Leandro Buss Becker & UFSC team; Guilherme Vianna Raffo & UFMG team.
	Sense of agency and automation design, *Bruno Berberian & Kevin Le Goff, ONERA - The French Aerospace Lab, France*
	Modulation of cortical electrical activity by deep brain stimulation of amygdala in rats. N. Drabowski, R. Walz, J. Pavei, G. Paim, A. Trofino and D. Formolo, *University Hospital, UFSC.*
19:20 – 22:30	**Gala dinner & Social Event**

Friday 9 December 2016	
9:00 – 9:40	**Plenary Session VII:** **New developments on lower extremity exoskeleton systems, Homayoon Kazerooni,** *University of California at Berkeley, Founder and CEO, suitX, US.*
9:40 – 10:20	**Invited Session IV: Smart Cyber-Physical Systems for Restoring Human Movement after Paralysis-1**
9:40 – 10:00	**Realtime EMG analysis for transcutaneous electrical stimulation assisted gait training in stroke patients,** T. Schauer[1],T. Seel[1], N. D. Bunt[1,2] P. Muller[1], J. C. Moreno[3], *[1]Control Systems Group, TU Berlin,Germany, [2]University of Twente, Enschede, The Netherlands, [3] Spanish National Research Council, Cajal Institute, Madrid, Spain.*
10:00 – 10:20	**Extremum Seeking applied to Neuromuscular Electrical Stimulation,** Tiago Roux Oliveira[1], Luiz Renno Costa[2], Alexandre Visintainer Pino[2], *[1]State University of Rio de Janeiro (UERJ), Brazil, [2] Federal University of Rio de Janeiro (COPPE/UFRJ), Brazil.*
10:20 – 10:40	*Coffee break*
10:40 – 12:00	**Invited Session IV: Smart Cyber-Physical Systems for Restoring Human Movement after Paralysis-2**
10:40 – 11:00	**Adaptive Control with Concave/Convex Parameterization for an Electrically Stimulated Human Limb,** Ruzhou Yang, Marcio de Queiroz, *Louisiana State University, Baton Rouge, LA, USA*
11:00 – 11:20	**EMG-driven models of human-machine interaction in individuals wearing the H2 exoskeleton ?** Guillaume Durandau[1], Massimo Sartori[1], Magdo Bortole[2], Juan C. Moreno[3], Jose L. Pons[2,3] Dario Farina[4]. *[1]Institute of Neurorehabilitation Systems, Universitatmedizin Gottingen, Germany; [2]Cajal Institute, CSIC, Madrid, Spain; [3]Tecnologico de Monterrey, Monterrey, Mexico, [4]Department of Biomedical Engineering, Imperial College London, UK.*
11:20 – 11:40	**A Comparative Study on Control Strategies for FES Cycling Using a Detailed Musculoskeletal Model** Ana Carolina Cardoso de Sousa, Felipe Moreira Ramos, Marien Cristina Narvaez Dorado, Lucas Oliveira da Fonseca, Antônio Padilha Lanari Bo, *University of Brasilia, Campus Darcy Ribeiro, Brazil.*
11:40 – 12:00	**Robust discrimination of flexion and extension phases for mobile Function electrical stimulation (FES) induced cycling in paraplegics** Constantin Wiesener, Stefan Ruppin, Thomas Schauer, *Control systems group at TU Berlin, Germany.*
12:00 – 13:00	**Open Panel CPHS: evolution, potential impacts and prospective - from an interdisciplinary view** A. V. Efremov[1], T. Schauer[2], G. Roucairol[3], F. Vanderhaegen[4], P.V. carvalho[5]. *[1]Moscow aviation Institute, Russia, [2]TU Berlin, Germany, [3]TERATEC, [4]University of Valenciennes, LAMIH CNRS, France, [5]IEN - UFRJ, Brazil.*
13:00 – 14:20	*Lunch*
14:20 – 16:20	**Regular session IV:** **Robotics**
14:20 – 14:40	**Modeling Teleoperated Robot Driving Performance as a Function of Environment Difficulty,** Justin Storms, Kevin Chen, Dawn Tilbury, *University of Michigan, Ann Arbor, USA.*
14:40 – 15:00	**Human Planning and Coordination in Spatial Search Problems** Kuo-Shih Tseng, Bérénice Mettler, *University of Minnesota, MN, USA.*
15:00 – 15:20	**Visualisation of the Motion Trajectory for Rolling Motion of Snake Robots using Virtual Chassis and Simplified Kinematics Motion Model** Cid Gilani[1], XiaoQi Chen[1], Chris Pretty[1], Carla Koike[2], *[1]University of Canterbury, Christchurch, Canterbury, New Zeland, [2]University of Brasilia, DF – Brazil.*
15:20 – 15:40	**Suspended Load Path Tracking by a Tilt-rotor UAV,** Brenner S. Rego, Guilherme V. Raffo, *Federal University of Minas Gerais, Belo Horizonte, Brazil.*
15:40 – 16:00	**Modeling and Supervisory Control of Mobile Robots: A Case of a Sumo Robot,** César R. C. Torrico[1], André B. Leal[2], Ana T. Y. Watanabe[2], *[1]Technological Federal University of Paraná – UTFPR, Pato Branco-PR, Brazil, [2]Santa Catarina State University – UDESC, Joinville-SC, Brazil*
16:00 – 16:20	**User Study for Hand-Guided Robots with Assisting Force Fields,** Florian Muller[1], Nele M. Fischer[1], Jens Jakel[1], Ulrike Thomas[2], Jozef Suchy[2], *[1]Leipzig University of Applied Science, Germany, [2]Chemnitz University of Technology, Germany.*
16:20 – 16:40	**Coffee break & Award**
16:40 – 18:00	**Tutorial session I Bruno Berberian** **My brain is out of the loop: a neuroergonomic approach of the Out of The Loop (OOTL) phenomenon**
18:00 – 19:00	**Farewell Reception**