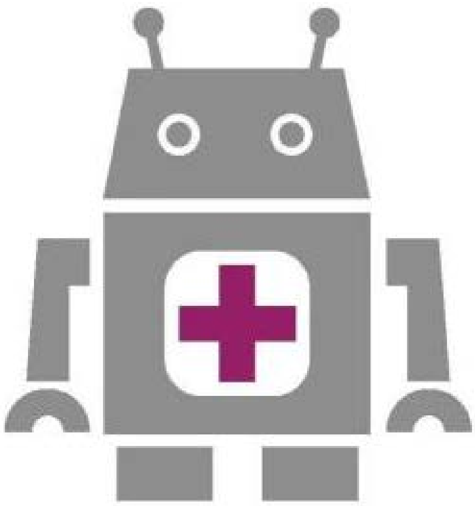
# COST Workshop on Social Robotics

## The future concept and reality of Social Robotics: challenges, perception and applications

## The role of Social Robotics in current and future society



## Applications Working Group Booklet

**Tuesday 11 - Thursday 13 June 2013**
**International Press Centre (IPC), Résidence Palace**
**Brussels, Belgium**

http://www.cost.eu/events/socialrobotics
#socialrobots

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# Programme

### Monday 10 June 2013

**Hotel NH Du Grand Sablon, Rue Bodenbroek 2/4, 1000 Brussels (BE)**

17.30 – 19.00: Workshop Registration
19.00 – 19.30: Welcome words by **COST representatives**
19.30 – 20.00: **Gian Piero Brunetta** (University of Padua, IT) "Robots in the cinema"
20.00 – 22.00: Dinner

### Tuesday 11 June 2013

**International Press Centre, Rue de la Loi 155, 1000 Brussels (BE)**

8.30 Workshop Registration

**9.00 – 13.00: Plenary Session (Polak Room) - Chair: Leopoldina Fortunati (University of Udine, IT)**

- 9.00 – 9.15: Official Opening by **Tatiana Kovacikova**, COST Office Head of Science Operations
- 9.15 – 9.30: Workshop Introduction by **Leopoldina Fortunati**, Head of the Organising Committee
- 9.30 – 10.00: **Anne Bajart** (EC/DG Connect A2 Robotics) "The EU-funded research programme in robotics: achievements and perspectives"
- 10.00 – 10.30: **Fabrizio Sestini** (EC/DG Connect) "Collective Intelligence, Internet Ethics and Sustainability: Issues for Social Robots"
- 10.30 – 11.00: **Sakari Taipale** (University of Jyväskylä, FI) "European perceptions of robots and related implications for the policies of the social"
- 11.00 – 11.30: Coffee break
- 11.30 – 12.00: **Atsuo Takanishi** (Waseda University, JP) "Some Aspects of Humanoid Robot Design"
- 12.00 – 12.30: **Antonio Bicchi** (University of Pisa, IT) "From Social Robots to Societies of Robots"
- 12.30 – 13.00: **Naomi Baron** (American University Washington D.C., US) "Shall We Talk? Conversing with Humans and Robots"

13.00 – 14.00: Lunch break

**14.00 – 16.00: Working Group Session I**

**Working Group "Challenges" (Maelbeek Room)**

**Chair: James E. Katz** (Boston University, US)

- 14.00 – 14.20: **James Katz** (Boston University, US) "Attitudes toward robots suitability for various jobs as affected robot appearance"
- 14.20 – 14.40: **Matthias Rehm** (Aalborg University, DK) "Culture Aware Robotics"
- 14.40 – 15.00: **Shuzhi Sam Ge** (National University of Singapore, SG) "Era of Social Robots"
- 15.00 – 15.20: **Christine Linke** (University of Berlin, DE) "Phenomena of Human-Social Robot-Interaction: The Social Construction of Reciprocity, (Inter-)Subjectivity and Relationship"
- 15.20 – 16.00: Panel Discussion

**Working Group "Perception" (Passage Room)**

**Chair: Ryad Chellali** (Italian Institute of Technology, IT)

14.00 – 14.20: **Maria Bakardjieva** (University of Calgary, CA) “This Bot Hurt my Feelings: Ethics and Politics for Social Bots”
14.20 – 14.40: **Nikhil Bhattacharya** (Institute for Liberal Arts, US) “With Our Technology, In Our Image: A Philosophical Analysis of Social Robots”
14.40 – 15.00: **Charles Ess** (University of Oslo, NO) “Robots and Humans as Virtuous Agents? Core questions and challenges”
15.00 – 15.20: **Michaela Pfadenhauer** (Karlsruhe Institute of Technology, DE) “The Contemporary Appeal of Artificial Companions”
15.20 – 16.00: Panel Discussion

**Working Group “Applications” (Polak Room)**

**Chair: Alessandro Saffiotti** (Orebro University, SE)

14.00 – 14.20: **Rytis Maskeliunas** (Kaunas University of Technology, LT) “Gaze tracking based emotional status determination”
14.20 – 14.40: **Timo Kaerlein** (Universität Paderborn, DE) “The robotic moment in mobile media. An inquiry into new intimacies in human-technology relationships”
14.40 – 15.00: **Pelachaud Catherine** (CNRS, FR) “Socio-emotional humanoid agent”
15.00 – 15.20: **Barbara Lewandowska Tomaszczyk and Paul A. Wilson** (University of Lodz, PL) “Affective robotics - modelling and testing cultural prototypes “
15.20 – 16.00: Panel Discussion

16.00 – 16.30: Coffee break

**16.30 – 18.30: Working Group Session II**

**Working Group “Challenges” (Maelbeek Room)**

**Chair: James E. Katz** (Boston University, US)

16.30 – 16.50: **Amparo Lásen** (University Complutense of Madrid, ES) “The Shared Agency between People and Technologies in the Context of the ‘Affective Paradox’ ”
16.50 – 17.10: **Maria Teresa Riviello** (Second University of Naples and IIASS, IT) “A Cross-Cultural Study on the Effectiveness of Visual and Vocal Channels in Transmitting Dynamic Emotional Information”
17.10 – 17.30: **Juha Röning** (University of Oulu, FI) “Natural Human Robot Interaction”
17.30 – 17.50: **Stefan Benus** (Constantine The Philosopher University, SK ) “Social aspects of entrainment in spoken interactions”
17.50 – 18.30: Panel Discussion

**Working Group “Perception” (Passage Room)**

**Chair: Ryad Chellali** (Italian Institute of Technology, IT)

16.30 – 16.50: **Sara Rosenblum** (University of Haifa, IL) “Brain-hand language secrets as reflected through a computerized system”
16.50 – 17.10: **Kimmo Vanni** (Tampere University of Applied Sciences, FI) “Social robotics as a tool for promoting occupational health”
17.10 – 17.30: **Shirley Elprama and An Jacobs** (Vrije Universiteit Brussel, BE) “Robots in the operating room”
17.30 – 17.50: **Elizabeth Broadbent** (The University of Auckland, NZ) “The social and emotional impact of robots in healthcare”
17.50 – 18.30: Panel Discussion

**Working Group “Applications” (Polak Room)**

**Chair: Alessandro Saffiotti** (Orebro University, SE)

16.30 – 16.50: **Patrick Law** (The Hong Kong Polytechnic University, HK) “Biomedical Engineering: The case of rehabilitation program in Hong Kong”

16.50 – 17.10: **Rui Loureiro** (Middlesex University, UK) “Social robots in the rehabilitation of cognitive and motor function”
17.10 – 17.30: **Anthony Remazeilles** (Tecnalia Research and Innovation, ES) “Development of mobile robots for providing assistance to the elderly population: experience acquired”
17.30 – 17.50: **Filippo Cavallo** (Scuola Superiore Sant'Anna, IT) “Social Robotics for healthcare applications: the Robot-Era experience”
17.50 – 18.10: **Renaud Ronsse** (Université Catholique de Louvain, BE) “Primitive-based entrainment in upper- and lower-limb periodic movement assistance by using adaptive oscillators”
18.10 – 18.30: Panel Discussion

**Wednesday 12 June 2013**

**International Press Centre, Rue de la Loi 155, 1000 Brussels (BE)**

8.30 – 9.00: Workshop Registration

**9.00 – 11.00: Plenary Session (Polak Room) - Chair: Anna Esposito (Second University of Naples and IIASS, IT)**

9.00 – 9.30: **Satomi Sugiyama** (Franklin College Switzerland, CH) **and Jane Vincent** (University of Surrey, UK) “Consideration of the mobile device as a form of social robot”
9.30 – 10.00: **Kerstin Dautenhahn** (University of Hertfordshire, UK) “Social robotics and real world applications – an interdisciplinary perspective”
10.00 – 10.30: **Anniina Huttunen** (University of Helsinki, FI) “Does Intelligence Matter? - Legal Ramifications of Intelligent Systems”
10.30 – 11.00: **David Cohen and Mohamed Chetouani** (University Pierre and Marie Curie, FR) “Social Signal Processing in Developmental Psycho-Pathology”

11.00 – 11.30: Coffee break

**11.30 – 13.30: Working Group Session III**

**Working Group “Challenges” (Maelbeek Room)**

**Chair: Harmeet Sawhney** (Indiana University, US)

11.30 – 11.50: **Carlo Nati** (Education 2.0, IT) “Cad software to introduce robotic design process at school”
11.50 – 12.10: **Chung Tai Cheng** (The Hong Kong Polytechnic University, HK) “The technologicalization of education in China and the case study of Home-School Communication System”
12.10 – 12.30: **Michele Viel and Giovanni Ferrin** (University of Udine, IT) “Taming social robots through playfulness and do it yourself: children in action”
12.30 – 12.50: **Linda Giannini** (MIUR, IT) “Pinocchio 2.0, robot and other stories”
12.50 – 13.30: Panel Discussion

**Working Group “Perception” (Passage Room)**

**Chair: Guglielmo Tamburrini** (University of Naples “Federico II”, IT)

11.30 – 11.50: **Nadia Berthouze** (University College London, UK) “Body Movement and touch behaviour as means to recognize and enhance affective experience”
11.50 – 12.10: **Marcin Skowron** (Austrian Research Institute for Artificial Intelligence, AT) “From Virtual to Robot Bartender: insights from the affective dialogue system”
12.10 – 12.30: **Anna Esposito** (Second University of Naples and IIASS, IT) “Emotional expressions: Communicative displays or psychological universals?”

12.30 – 12.50: **Kristrún Gunnarsdóttir** (Lancaster University, UK) “Robot assistance: prominent visions and problem domains”
12.50 – 13.30: Panel Discussion

**Working Group “Applications” (Polak Room)**

**Chair: Sara Rosenblum** (University of Haifa, IL)

11.30 – 11.50: **Hicham Atassi** (Brno University of Technology, CZ) “An Autonomous intelligent system for Call Centres Surveillance and Assessment”
11.50 – 12.10: **Tatsuya Matsui** (Flower Robotics Inc., JP) “A design approach for the robots to be accepted in the society”
12.10 – 12.30: **Claudia Pagliari** (University of Edinburgh, UK) “Roles, relationships and rights in interactions between real and virtual humans: insights and implications from a study on Avatar-supported eHealth”
12.30 – 12.50: **Vanessa Evers** (University of Twente, NL) “Human Robot Co-existence”
12.50 – 13.30: Panel Discussion

13.30 – 14.30: Lunch break

**14.30 – 16.30: Working Group Session IV**

**Working Group “Challenges” (Maelbeek Room)**

**Chair: Harmeet Sawhney** (Indiana University, US)

14.30 – 14.50: **Ryad Chellali** (Italian Institute of Technology, IT) “The Social Robot: myths, reality and perspectives”
14.50 – 15.10: **Raul Pertierra** (Manila University, PH) " The person in the machine: the machine in the person”
15.10 – 15.30: **Joachim Hoeflich and Afifa El Bayed** (University of Erfurt, DE) “The Acceptance of Social Robots in Today’s Germany and its Prospects”
15.30 – 15.50: **Nello Barile** (Iulm, University of Milan, IT) “The automation of taste: anthropological effects of Shazam and another apps used as search engines in the everyday life”
15.50 – 16.30: Panel Discussion

**Working Group “Perception” (Passage Room)**

**Chair: Guglielmo Tamburrini** (University of Naples “Federico II”, IT)

14.30 – 14.50: **Davide Fornari** (Supsi University of Applied Sciences and Arts of Southern Switzerland, CH) “Face as interface: anthropomorphic and zoomorphic artefacts”
14.50 – 15.10: **Takaaki Kuratate** (Technical University of Munich, DE) “Mask-bot: a retro-projected talking head for social interaction media applications”
15.10 – 15.30: **Carl Vogel** (Trinity College Dublin, IE) “Intending no offence”
15.30 – 15.50: **Etienne Burdet** (Imperial College London, UK) “Adaptive nature of human-human interaction”
15.50 – 16.10: **Peter Sinčák** (Technical University of Kosice, SK)
16.10 – 16.30: Panel Discussion

**Working Group “Applications” (Polak Room)**

**Chair: Sara Rosenblum** (Haifa University, IL)

14.30 – 14.50: **Milan Gnjatović** (University of Novi Sad, SR) “The Child, the Therapist, and the Robot: Adaptive Dialogue Management in Three-Party Interaction”
14.50 – 15.10: **Sonya Meyer** (Haifa University, IL) “Social Robots as possible Celiac Disease management mediators for supporting adherence to a healthy lifestyle”
15.10 – 15.30: **Hideki Kozima** (Miyagi University, JP) “Social robot for autism therapy”

15.30 – 15.50: **Frano Petric** (University of Zagreb, HR) “Application of Humanoid Robots in Diagnostics of Autism”

15.50 – 16.30: Panel Discussion

**16.30 – 18.00: Social Robots Exhibition** (opened by private reception)

**Thursday 13 June 2013**

**International Press Centre, Rue de la Loi 155, 1000 Brussels (BE)**

8.30 – 9.00: Workshop Registration

**9.00 – 10.30: Plenary Session (Polak Room) - Chair: Thierry Keller (Tecnalia Research & Innovation, ES)**

9.00 – 9.30: **Paolo Dario** (Scuola Superiore Sant’Anna, IT) “Robot Companions for Citizens: a Vision to Address Societal Challenges and to Improve Quality of Life”

9.30 – 10.00: **Aude Billard** (École Polytechnique Fédérale de Lausanne, CH) “Issues when transferring knowledge from humans to robots”

10.00 – 10.30: **Alessandro Vinciarelli** (University of Glasgow, UK) “Social Signal Processing”

10.30 – 11.00: Coffee break

**11.00 – 13.00: Working Group Session V**

**Working Group “Challenges” (Maelbeek Room)**

**Chair: Maria Bakardjieva** (University of Calgary, CA)

11.00 – 11.20: **Alessandro Saffiotti** (Orebro University , SE) “Towards a human robots-environment ecosystem: opportunities and challenges”

11.20 – 11.40: **António Brandão Moniz** (Karlsruhe Institute of Technology, DE) “Intuitive interaction between humans and robots in industrial environments: the social robotics role”

11.40 – 12.00: **Maria Koutsombogera** (Institute for Language And Speech Processing, EL) “Developing resources of social interactions”

12.00 – 12.20: **Costanza Navarretta** (University of Copenhagen, DK) “The annotation and use of multimodal corpora for modelling believable social robots”

12.20 – 13.00: Panel Discussion

**Working Group “Perception” (Passage Room)**

**Chair: Valèria Csèpe** (Hungarian Academy of Sciences, HU)

11.00 – 11.20 **Valéria Csépe** (Hungarian Academy of Sciences) “Augmented reality and assisted perception”

11.20 – 11.40 **Angelo Cangelosi** (Plymouth University, UK) “Embodied Language Learning in Human-Robot Interaction”

11.40 – 12.00 **Agnieszka Wykowska** (Ludwig Maximilians Universität, DE) "Cognitive- and social neuroscience for social robotics - how the present challenges can tell us where to go in the future”

12.00 – 12.20 **Karola Pitsch** (Bielefeld University, DE) “Social Learning from an Interactional Perspective. The role of a robot's feedback in tutoring situations in human-robot-interaction”

12.20 – 13.00: Panel Discussion

**Working Group “Applications” (Polak Room)**

**Chair: Alicia Casals** (Universitat Politècnica de Catalunya, ES)

11.00 – 11.20: **Thierry Keller** (Tecnalia Research & Innovation, ES) “Robotics for Neurorehabilitation: Current challenges and approaches”

11.20 – 11.40: **Alicia Casals** (Universitat Politècnica de Catalunya, ES) “Social Acceptance in robotics for health”

11.40 – 12.00: **Peter Friedland** (Peter Friedland Consulting, US) “Developing Trust in Human-Machine Interaction”

12.00 – 12.20: **Marcos Faundez Zanuy** (Escola Universitaria Politecnica de Mataro, ES) “Xnergic: a Tecnocampus initiative to promote engineering vocations”

12.20 – 13.00: Panel Discussion

13.00 – 14.00: Lunch break

**14.00 – 15.30: Summaries by Working Groups’ Chairs - Chair: James Katz (Boston University, US)**

**15.30 – 16.00: Conclusions and Follow-Up - Chair: Leopoldina Fortunati (University of Udine, IT)**

# Working Group Speakers

## Alessandro Saffiotti
## Working Group Chair
## Sessions I and II (11 June)


Organisation Örebro University

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Biography Alessandro Saffiotti is full professor of Computer Science at the University of Orebro, Sweden, where he heads the AASS Cognitive Robotic Systems laboratory. He holds a MSc in Computer Science from the University of Pisa, Italy, and a PhD in Applied Science from the Universite Libre de Bruxelles, Belgium. His research interests encompass artificial intelligence, autonomous robotics, and technology for elderly people. He is the inventor of the notion of "Ecology of physically embedded intelligent systems", a new approach to include robotic technologies in everyday life. This approach is currently applied to the domain of elderly assistance in the EU project Robot-Era. He has published more than 140 papers in international journals and conferences, and organized many international events. In 2005 he was a program chair of IJCAI, the premier conference on Artificial Intelligence. He is involved in four EU FP7 projects, in several EU networks, and in many national projects.


Abstract **Toward a human-robots-environment ecosystem: opportunities and challenges**

In response to the current demographic changes, the field of robotics is putting a growing emphasis on the development of robotic technologies suitable to provide assistance to elderly people, and to improve their independence and quality of life. Many of the current efforts in assistive robotics concentrate on the development of powerful robotic devices able to perform domestic chores or domestic assistive tasks, often mimiking the peformance of a human assistance. In this presentation, I argue that a redirection of this effort is needed in three aspects. First, to put a stronger attention on the service level, that is, the identification of the services which would really make robots added value devices. Second, to replace the vision of a powerful, autonomous single-robot device should be replaced by an ecosystem of robotic devices, where devices can be dynamically added and removed, and can cooperate to collectively produce the required services. Third, to extend this vision beyond the domestic boundaries, to create an ecosystem of robotic devices pervasively distributed in the houses, shops, streets and public places. This ecosystem should provide everywhere assistance to the senior citizens at all levels, from the homes to the town. The above perspective will be illustrated in the context of the Robot-Era EU project. I will discuss the Robot-Era concept, its user-centered development approach, and some of the interesting technical challenges and solutions which are being developed in that framework.

## Rytis Maskeliunas


Organisation Kaunas University of Technology

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Biography Rytis Maskeliunas (Dr. in Computer Science) currently works as deputy director at UAB “Informacijos spektras” on integrating various EU and local scientific research projects, and as a sen. scientific researcher and proj. manager at Kaunas University of Technology, Information Faculty and Automation and Control Systems Inst. Main areas of interests are: modeling, development and analysis of assoc. multimodal interfaces, engineering of automation systems and robotics, self – service solutions. He holds an iEEE membership with an expertise in the above. He has won various awards/honours including the Best Young Scientist Award of 2012, National Science Academy Award for Best Young Scholars (2010). He has coordinated / participated in several res. projects in computer science domain and was involved in the EU COST actions 278, 2102 and is an MC member (Lithuania) of the COST IC1002. He is (co)author of over 40 refereed scientific articles and serves as a reviewer for a number of journals.


Abstract **Gaze tracking based emotional status determination**

Gaze-tracking can be especially useful investigating the behavior of the individuals with physical and psychological disorders. Authors present parts of the work on the development of multimodal HCI control interface targeted at paralyzed people. The proposed ANN based emotional status determination solution is presented based on the data gathering from a gaze tracking system, while providing the participants with an audiovisual stimulus (strongly emotionally “stimulant” slides/videos with sounds). Our gaze tracking algorithm finds the rough pupil center in the iterative manner and executes the logical indexing on the gray level image using certain threshold of grayness value, which is variable (adaptive). The center of eye image is used as starting position for the region. We have implemented a 3 layer ANN: the first layer was made from of 8 neurons, the second of 3 neurons and the output layer of 1 neuron. ANN networks had a variable input number and were trained based on 3 features: the size of the pupil, ant the position of the pupil (coordinates x, y) and speed -life experimental evaluation (20 participants) of the gaze tracking data confirmed that the interpretation of actual emotions (1) neutral (regular, typical state); 2) disgust; 3) funny state; and 4) interest (to be interested in something)) of each of the participants along with the parameters we measured (the size, the position, the speed, the acceleration of eye pupil) were quite different and dependent on each individual test subject. The size of each participant’s eye pupil was different during the perception of each emotion. The deviation data showed that it is important to note that the size can change quiet reasonably during a time period while still experiencing same or similar feelings or emotion. Overall registration

period of the center of eye pupil was divided into four parts based on the shown emotional stimuli. The analysis of movement has shown that as was in the case of eye pupil's size – this parameter can only be used in combination with other parameters – and in no way only by itself. The same was also true for the average values of speed and acceleration of eye pupil. As a result the gaze tracking based emotion recognition system must be adapted (trained) to the individual data of each of the participants in order to reliably recognize the current emotional state of the person. The overall best recognition accuracy performance rate (~90%) was achieved when we used 18 samples per feature. This means that the system can determine the emotion with a 2 second delay with approximately 10 % deviation. The use of parameters gained by gaze tracking combined with artificial neural network modeling and calculations allowed achieving the average subject dependent recognition of 87.35 %. At least in our limited evaluation the joyful emotions were recognized most accurately (90.27 %), and the recognition error for the neutral emotions was the largest (16 %).


## Timo Kaerlein

Organisation University of Paderborn, Germany

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Biography Timo Kaerlein is a doctoral researcher in the DFG-funded Research Training Group ‘Automatisms’ at the University of Paderborn (Germany). The group investigates decentralized processes of structural change in information technology, media, and culture. Kaerlein’s research interests include media theory, digital culture, personal/mobile media, cultural theory of play, and sociological technology studies. In his doctoral research he strives for an understanding of emergent relationships between human body and technological artifacts ensuing with the proliferation of mobile networked computers like smartphones. The investigation covers a wide range of prototype technologies, from wearable computing devices to mobile telepresence robotics.

Abstract **The robotic moment in mobile media. An inquiry into new intimacies in human-technology relationships**


Social robotics promises a way of interacting with technology that will make people feel comfortable and familiar around their robotic companions and servants. The proposed modality of interaction significantly differs from more traditional object relationships like those towards tools, machines, and media. One goal in the interaction design of social robotics is to make people all but forget that they are dealing with technology at all. Instead, the encounter with social robots shall feel personal, intimate, warm and immediate. The paper argues that the projected “hybrid society” (CoR-Lab, University of Bielefeld) of humans and robots is by no means a distant science fiction vision. In Bruno Latour’s words: “Humans are no longer by themselves” (Latour 1999: 190). In everyday interactions with mobile devices people are gradually getting adapted to a world where personal smart assistants are accompanying (sometimes even supervising) every decision they take. Research on Natural User Interfaces (NUI) explores ways of interaction that take face-to-face dialogue with humans as their idealized matrix, including natural voice recognition and output, gesture control and habitualized micro interactions. One could say that today’s smartphone is a proto-social robot, consistently in close contact to its owner’s body and their central hub of information and connectivity. This suggestion is supported by the use of smartphones in many social robotics implementations, e.g. acting as a robot’s ‘brain’, as a remote command interface or platform hosting a virtual avatar. In the paper, several examples shall outline the “robotic moment” (Turkle 2011) in mobile media. They include Apple’s Siri intelligent personal assistant, the social robot- smartphone hybrid Elfoid developed by a Japanese research team led by android scientist Hiroshi Ishiguro (cf. Kaerlein 2012), and a series of playful crossovers of robot and smartphone technology like the Bandai Smartpet Robot Dog, the cell-phone robot CALLY (Yim/Shaw

2009), and prototypes of “intimate” and “shape-changing mobiles” developed at the Deutsche Telekom Laboratories in Berlin (Hemmert 2009). Furthermore, large-scale projects (e.g. LIREC in the EU) have investigated long-term relationships with artificial companions that can migrate between devices and thus inhabit a physical body (robot shape) and screens alike. Here, the distinction between robotics and the use of (mobile) personal computing devices becomes blurry. To describe these developments and the changing human-technology relationships accompanying them, the paper turns to socio-psychological concepts of relational artifacts (Turkle et al. 2006), object-centered sociality (Knorr Cetina 1997), and attachment to material devices (Turner/Turner 2012). It will be argued that while these approaches can explain some of the empirical phenomena we are confronted with, one needs to apply cultural theory to be able to identify patterns of object fetishization that are abundant in modernity although their genealogy is much older (cf. Latour 1994, Böhme 2006). Seen from this angle, ‘social’ interactions with technology like anthropomorphization (cf. Epley/Waytz/Cacioppo 2007) and animism have a deep history in magic, religion and ritual, but are likewise transferred to modern technology as a highly functional way of adoption or domestication (cf. Silverstone/Haddon 1996, Hjorth 2009). When, in the field of social robotics, designers and engineers now utilize the accumulated history of social object relationships to make the interaction with technology more enjoyable (by giving it a ‘human touch’), they in fact tap into a vast repository of cultural knowledge, of expectations towards and previous experiences with technology, of fears and resistances, wishes and dreams. The paper will provide a way of thinking about the object relationships relevant in social robotics as having an immediate prequel in the ways people connect with their mobile devices, including certain affective appropriations diverging widely from considerations of functional use value. Thus research in the field of mobile media can tell us a lot about design and implementation challenges to be expected in social robotics.

References: Literature Böhme, H. (2006), Fetischismus und Kultur: Eine andere Theorie der Moderne, Rowohlt, Reinbek bei Hamburg. Epley, N., Waytz, A. and Cacioppo, J.T. (2007), “On seeing human: A three-factor theory of anthropomorphism”, Psychological Review, Vol. 114 No. 4, pp. 864–886. Hemmert, F. (2009), „Life in the Pocket: The Ambient Life Project. Life-Like Movements in Tactile Ambient Displays in Mobile Phones“, International Journal of Ambient Computing and Intelligence, Vol. 1 No. 2, pp. 13-19. Hjorth, L. (2009), “Domesticating New Media. A Discussion on Locating Mobile Media”, in Goggin, G. and Hjorth, L. (Eds.), Mobile technologies: From telecommunications to media, Routledge, New York, NY, pp. 143–157. Kaerlein, T. (2012), “Presence in a Pocket. Phantasms of Immediacy in Japanese Mobile Telepresence Robotics“, communication +1, vol 1, article 6. Knorr Cetina, K. (1997), “Sociality with Objects. Social Relations in Postsocial Knowledge Societies”, Theory, Culture & Society, Vol. 14 No. 4, pp. 1–30. Latour, B. (1994), We have never been modern, 3rd ed., Harvard Univ. Press, Cambridge, Mass. Latour, B. (1999), Pandora's hope: Essays on the reality of science studies, Harvard Univ. Pr, Cambridge, Mass. Silverstone, R., and Haddon, L. (1996), “Design and the Domestication of Information and Communication Technologies: Technical Change and Everyday Life”, in Silverstone, R. and Mansell, R. (Eds.), Communication by Design. The Politics of Information and Communication Technologies, Oxford University Press, Oxford. Turkle, S. (2011), Alone together: Why we expect more from technology and less from each other, Basic Books, New York, NY. Turkle, S., Taggart, W., Kidd, C.D. and Dasté, O. (2006), “Relational artifacts with children and elders. The complexities of cybercompanionship”, Connection Science, Vol. 18 No. 4, pp. 347–361. Turner, P. and Turner, S. (2012), “Emotional and aesthetic attachment to digital artefacts”, Cognition, Technology & Work, published online at: http://link.springer.com/content/pdf/10.1007/s10111-012-0231-x. Yim, J.-D. and Shaw, C.D. (2009), “Designing CALLY”, in Olsen, D.R., Arthur, R.B., Hinckley, K., Morris, M.R., Hudson, S. and Greenberg, S. (Eds.), CHI 2009 - digital life, new world: Conference proceedings and extended abstracts, ACM Press, New York, NY, pp. 2659–2662.

## Catherine Pelachaud


Organisation CNRS at LTCI, FR

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Biography Catherine Pelachaud is a Director of Research at CNRS at LTCI. She received her PhD in Computer Graphics at the University of Pennsylvania, Philadelphia, USA in 1991. Her research interest includes representation language for agent, embodied conversational agent, nonverbal communication (face, gaze, and gesture), and modeling of socio-emotional behaviors. She has been involved and is still involved in several European projects related to multimodal communication (EAGLES, IST-ISLE), to believable embodied conversational agents (IST-MagiCster, ILHAIRE, VERVE, REVERIE), emotion (Humaine, CALLAS, SEMAINE, TARDIS) and social behaviors (SSPNet). She is member of the Humaine Association committee. She is associate editors of several journals among which IEEE Transactions on Affective Computing and Journal on Multimodal User Interfaces. She has co-edited several books on virtual agents and emotion-oriented systems.


Abstract **Socio-emotional humanoid agent**

In this talk I will present our current work toward endowing virtual agents with socio-emotional capabilities. I will start describing an interactive system of an agent dialoging with human users in an emotionally colored manner. We are using this system to drive a humanoid robot and virtual agents. Both agents type, be virtual or physics, can be driven from two different representation languages, namely Function Markup Language FML that specifies the communicative intentions and emotional states, and Behavior Markup Language BML that describes the multimodal behaviors to be displayed by the agents. Through its behaviors, the agent can sustain a conversation as well as show various attitudes and levels of engagement. I will describe methods, based on corpus analysis, user-centered, or motion capture, we are using to enrich its repertoire of multimodal behaviors. These behaviors can be displayed with different qualities and intensities to simulate various communicative intentions and emotional states.

## Barbara Lewandowska Tomaszczyk


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Biography Barbara Lewandowska-Tomaszczyk (PhD 1972, Dr habil.1987 Conceptual analysis, linguistic meaning, and verbal interaction) is Professor Ordinarius of English language and linguistics at the University of Lodz, Poland. Her interests are in semantics and pragmatics, corpus linguistics, translation studies, and discourse analysis. Author of numerous publications, she has been invited to read papers at international conferences and serves as a board member of academic and publishing bodies. Editor-in-Chief of the series Lodz Studies in Language, Peter Lang Verlag. Paul A. Wilson (co-author) is Visiting Professor in the Institute of English Studies at the University of Lodz. He received his PhD in Psychology from Birkbeck, University of London (2000), His research interests include the conceptual representation of emotion across languages and cultures.

Abstract **Affective robotics - modelling and testing cultural prototypes**

**By Barbara Lewandowska-Tomaszczyk and Paul A. Wilson**


Our contribution can be considered part of Affective Robotics and presupposes a theory of human emotions, their description and presentation. Social Robotics considers emotions in their broad biological sense as automated homeostatic regulation (Damasio, 2003:35) at different levels of biological behaviour, including man-robot linguistic communication. Taken in this sense, robots, both expressing artificial emotions as well as perceiving and recognising them, can be modelled in terms of emotional-homeostatic architecture. Our psychological and linguistic findings on emotions provide some ground to predict that part of our research methodology can either be more directly applicable at the interface and robot design of emotion modelling or can provide some materials on which to further develop models of social interactive robots to be used in different functions such as medical and therapeutic aids, educational and entertaining devices, etc. While preliminary emphasis in social robotics is conventionally put on dyadic query-response acts in man-machine communication, more sophisticated modelling will involve more varied signals (components) and patterns of linguistic structures and behaviour for emotion recognition and expression. A change of events in the surrounding is often signalled via (bodily and linguistic) emotional behaviour in human agents, and is likely to be perceived as such by robots. In other words, human emotional behaviour, expressed by our bodies and language, signal changes in the contextual surrounding, and whereas some of these can be for instance threatening and induce fear, others will be entertaining and bring about joy and happiness. Our emotion research uses two approaches to emotion studies: the GRID and cognitive corpus linguistics methodologies. The GRID instrument employs a system of

dimensions and components, which bring about insight into the nature of basic emotion prototypical structures. The cognitive corpus linguistics approach provides information on the probabilities of the occurrence of some linguistic patterns of emotional language use based on their frequencies and distributional patterns. Both methods are employed in the context of basic Emotion Event scenarios (EES) (Lewandowska-Tomaszczyk and Wilson, in press), which identify emotion stimuli in the Experiencer, and their embodied (bodily and mental) and exbodied reactions, linguistically expressed via segmental and prosodic properties, which characterise some but not other emotional states. Our system does not provide all the information to enable explicit, rich-context modelling of emotion production or perception but provides sufficient data to model culture-bound human-like emotional behaviour by resorting to the clusters of preferential conditions present in the implementation of a particular Emotions Event Scenario in a given cultural and linguistic context. To exemplify our research we refer to our methodology in some detail and quote some examples with reference to contrastive English and Polish materials concerning two basic emotions of contrastive polarity: fear and joy. In the GRID methodology that we employ, universal prototypical emotion terms, such as fear, joy and anger, are evaluated on scales comprising 144 features (e.g., “had eyebrows go up”, “smiled”, “increased the volume of voice”) that are central to emotion activity. Performing analyses on GRID data, Fontaine et al. (2007) have shown that emotional representation can be divided into four dimensions (evaluation, power, activation, and unpredictability). The evaluation dimension is characterised by appraisals of intrinsic pleasure and goal conduciveness (e.g., the features “smiled” and “frowned”). Feelings of power and weakness are central to the power dimension, which includes features such as “loud voice” and “closed eyes”. The activation dimension is mainly characterised by sympathetic arousal, with typical features being “breathing getting faster” and “abrupt body movements”. Appraisals of novelty and unpredictability are compared with expectedness or familiarity on the unpredictability dimension, which includes features such as “raised eyebrows”. The differences in mappings of individual emotions on these four dimensions can provide important input to the modelling of emotion-sensitive interactive robots. This can be exemplified if we compare the patterning of fear and joy. Being a more positively evaluated emotion, joy is much more likely to be accompanied by a smile than fear. Whereas the low power associated with fear is likely to be associated with a “quiet voice”, the high power that characterises joy is likely to be associated with a “loud voice”. Fear, being slightly higher in activation than joy, is likely to be relatively more associated with, for example, “breathing faster”. Finally, fear is somewhat higher than joy on unpredictability and so would be relatively more associated with features such as “eyebrows up”. Of primary importance in our studies is the culture-specific perspective on particular emotions and their clustering, which is potentially one of the crucial challenges to modelling emotion-sensitive interactive robots as they are likely to be used in multi- and inter-cultural and multi-linguistic contexts. There is a wealth of evidence pointing to a lack of cross-linguistic and cross-cultural consistency in emotions. Our research with the GRID instrument has shown, for example, that British English fear is rated more highly on the power dimension than its Polish counterpart strach, suggesting that British English fear is more akin to a variant of fear termed fight in which an individual feels powerful and dominant (Lewandowska-Tomaszczyk & Wilson, in press). The lower power associated with strach is consistent with fright whereby the individual experiences a paralysing effect and feels weak, submissive and passive. The frequencies gained from Polish and English corpora on the fight and fright fear event scenarios produced consistent results, highlighting the extent to which the two research approaches complement each other. A culturally competent robot would need, for example, to be able to decode that both the “loud voice” associated with the high power/fight of fear and the “closed eyes” that characterises the low power/fright of strach are part of the fear profile. In another cross-cultural example, we have found that British English joy is lower on the power dimension than the Polish equivalent radość. Again, this would pose decoding problems for an emotion-sensitive interactive robot as radość would be relatively more characterised by “spoke faster” and joy by “quiet voice”, for example. References Damasio, A. (2003). Looking for Spinoza: Joy, sorrow, and the feeling brain, Harcourt. Fontaine, J.R.J., Scherer, K.R., Roesch, E.B. and Ellsworth, P.C. (2007). The world of emotions is not two-dimensional. Psychological Science, 18(12), 1050-1057. Lewandowska-Tomaszczyk, B., & Wilson, P. A. (in press). English fear and Polish strach in contrast: GRID approach and Cognitive Corpus Linguistic Methodology. In J. Fontaine, K. R. Scherer & C. Soriano (Eds.). Components of emotional meaning: A Sourcebook. Oxford: OUP.

## Patrick Law

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Biography Patrick LAW received his Ph.D. in sociology from The University of New South Wales, Australia, and is currently assistant professor in the Department of Applied Social Sciences of The Hong Kong Polytechnic University. His research interest is on modernity and social development in China. He co-authored (2004) Marriage, Gender, and Sex in a Contemporary Chinese Village, co-edited (2006) New Technologies in Global Societies, edited (2012) New Connectivities in China: Virtual, Actual and Local Interactions, and was guest editor (2008) of special issues on ICTs and China and on ICTs and Migrant Workers in Contemporary China for Knowledge, Technology and Policy 21(1-2). Recently, he is working on mobile media and political participation.

Abstract **Biomedical Engineering: The case of rehabilitation program in Hong Kong**

Health technology, particularly the biomedical engineering, is central to the promotion of health assessment, medical diagnosis, medical intervention, and rehabilitation in hospitals. For instance, the coronary angiographic test, the electrical stimulation for the patient with spinal cord injury, the development of assistive technology for the stroke patient, and the orthotic and prosthetic services. All these medical services require the development of biomedical engineering, and above all, the knowledge of the synergy of health technology and human body functioning. The synergy is not only technological; it is emotional, social, as well as cultural. A patient might feel frustrated when wearing a prosthetic limb; the design of the assistive technology for stroke patient might not be that socially appealing; and the fall-tracking system developed for the aged Chinese should be culturally fit with their folk religious beliefs. In view of all these aspects, this paper attempts to present the case rehabilitation program in Hong Kong. First, the paper introduces how the health technology is applied in the rehabilitation program. Second, it discusses the difficulties in applying the technological devices to the human body. In Hong Kong, the patients are largely Chinese. Chinese has a deep cultural tradition in interpreting the practice of technology. Thus, in this part, focus will be on more on the social and cultural aspects of the synergy of the technological devices to the Chinese human body.

## Rui Loureiro

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Biography Dr. Rui Loureiro is a senior lecturer in Interactive Systems at Middlesex University, director of the Human Interactive Systems Lab (HumanIS Lab) and chair of the newly established International Consortium on Rehabilitation Robotics. Previously to joining Middlesex University in 2010, he enjoyed senior research appointments at the University of Reading, Royal Berkshire Hospital NHS Foundation Trust, and engineering consultancies at Synectic Design LTD. He specialises in advanced robotics and human interactive systems for rehabilitation engineering and has pioneered work in robot-aided stroke neurorehabilitation and movement disorders. In 2004, he received the Top 10 Britain’s Young Engineer award from SET for Britain and in 2006, the Siemens Automation & Drives award from InstMC UK. He is associated with a number of professional organisations, holds five patents, and has published widely in the areas of rehabilitation engineering, human-machine interaction, robotics and control.

Abstract **Social robots in the rehabilitation of cognitive and motor function**

Maintaining motivation and attention levels while learning new motor skills or re-learning forgotten skills after neurological impairment, has been shown to have a positive impact on brain plasticity. Strategies for influencing behaviour in brain injury or cognitive impaired patients are needed, not only for therapy engagement but also for supporting appropriate levels of motivation essential for motor learning and generalisation of learning to occur. The assumption is that by providing individuals with motivating and challenging therapy at their convenience will result in longer therapy exposure, ultimately lowering impairment and disability. Such therapies must be delivered in a well-monitored and structured environment that is acceptable to the clinicians responsible for patient’s recovery management. Understanding the individual’s goals is important as needs and motives often drive goals, influence behaviours and affect personal effort. Strategies for increasing and maintaining patient interest vary. Some systems incorporate activities of the daily living such as car steering into the therapy paradigm whereas other systems attempt to motivate patients via functional reaching and grasping. Other studies propose to address the social exclusion problem by developing systems that provide cooperative tasks between patient and therapist and through collaborative play between individual patients and between patient groups. Recent work looking at interactions between stroke patients and companion robots has shown that it is possible to increase engagement at a task (e.g. moving books from one table top to another) when robots assume a coaching role (robot prompting for actions using simple beeping noises) rather than providing physical assistance. Our recent work examining how group interactions

reshape an individual’s mental model while interacting with a sonic robot and with enhanced artifacts presents with opportunities to explore the dynamics of group collaborations in therapy. This talk will focus on the importance of transferring skills to functional independence, on conducting therapy in a social context and new ways of using robots in therapy (not necessarily to assist movement). The challenges for Europe in this domain lie on not only developing embodied robotic entities that are socially meaningful but on designing interactions that can effectively capture creative expression or playful activity beyond the clinic or home while enhancing sensory/emotional experiences, symbolic/emotional expression, cognitive development and social connectedness.

## Anthony Remazeilles


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Biography Dr. Anthony Remazeilles obtained a MSc in Computer Science and Artificial Intelligence from the University of Rennes 1 in 2001, and a PhD in Computer science from the University of Rennes in 2004. From 2001 to 2006, his research concerned the vision-based control of robotics systems within large navigation spaces. From 2006 to 2008, he was a Post-Doctoral researcher at the “Commissariat à l’Energie Atomique” (CEA-LIST), Fontenay aux Roses, France. He was involved in the development of a semi-autonomous mobile arm providing vision-based grasping assistance to disabled people within the framework of the ITEA ANSO project that received an ITEA Appreciation Award in 2008. Since 2008, he has been working in the Health Division of Tecnalia Research an Innovation, San Sebastian, Spain, designing vision- and robotic-based solutions for human-centred applications. He has contributed to 17 peer-reviewed articles (conferences and journals), and holds a patent on vision-based object grasping.


Abstract **Development of mobile robots for providing assistance to the elderly population: experience acquired**

In this presentation, we will gather the experience we have achieved in developing mobile assistive robots to provide support to elderly people in their daily life activities at home. After briefly describing the two projects in which such trials were realized, namely companionAble and Florence, we will describe the user involvement process used in both projects, showing how theoretical collaboration can be turned into an active and concrete collaboration highly valued by involved persons. We will then highlight the aspects we identified as key factors to promote/increase the acceptance by the potential end-users as well as the impact of assistive robotics on our society.

## Filippo Cavallo

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Biography Filippo Cavallo received the Master Degree in Electronic Engineering from the University Of Pisa, Italy, and the PhD degree in Bioengineering at Scuola Superiore Sant’Anna, Pisa, Italy. Currently he is Assistant Professor, focusing on biomechanical analysis, wearable sensor systems, sensor networking, localization and navigation system, biomedical signal and event processing, home automation, tele-care, acceptability and usability, ICT and AAL roadmapping. He participated in various National and European projects, is currently project manager of Robot-Era, ASTROMOBILE, RITA, AALIANCE2, Parkinson Project and is author of various papers on conferences and ICI journals. He visited the ROBO-Casa Lab at Waseda University, Tokyo, Japan, as Post Doctoral researcher (2007), working on the wireless sensor network and the Tecnalia Innovation Center, a private R&D research entity in San Sebastian, Spain, working on wearable sensor system for AAL (2012).

Abstract **Social Robotics for healthcare applications: the Robot-Era experience**

New European population projections have recently underlined that the number of elderly persons living in Europe will quickly increase in the coming years. This demographic trend will lead to: (1) a growing number of older people living alone and in need of (intensive) care, (2) an ageing workforce and (3) more financially well-appointed and wealthy senior citizens ready to enjoy their third age. Robotics technologies have nowadays reached a mature level of development allowing the implementation of service robotics systems able to perform different service tasks not only for industry, but also for “ageing well” applications, which are conceived to improve the independent living and quality of life of elderly people and to provide efficient cares. The rising request of services for ageing well should affect the growth of the service robotics market, however, despite such research progresses and increasing industrial and social interest and commitment, the service robotics market has not fully developed its enormous potential yet. We believe that, in order to overcome the gap between the developing robotics technologies for “ageing well” and the service robotics market, the following aspects should be necessarily faced: • a full user- and town-centred design approach with multi-disciplinary expertise for design and assessment of acceptability, usability and attitude of elderly people; • further progress in robotics research and technology for the development of robotic system integrated in smart environments and with rich sensory-motor skills for grasping, manipulation, and locomotion, and high level cognitive and learning competencies for reasoning, planning and decision-making; • an extended experimental trial phase, where service robotics prototypes and products are not just demonstrated or

validated in a laboratory or with limited tests in realistic scenarios, but truly tested in the accomplishment of their intended tasks, in real scenarios, with real users, and for a sufficiently long period of time; • an exhaustive investigation of enabling factors for the acceptability and ultimate market take-up of service robots, such as dependability, safety, robustness, standard, legal and regulatory issues, insurance, operational costs, etc. This work aims to show the approach and the preliminary results of the Robot-Era Project (2012-2015), that was conceived to develop, implement and demonstrate the general feasibility, scientific/technical effectiveness and social/legal plausibility and acceptability by end-users of a plurality of complete advanced robotic services, integrated in intelligent environments, which will actively work in real conditions and cooperate with real people and between them to provide favorable independent living, improving the quality of life and the efficiency of care for elderly people. In Robot-Era, different robotic systems are integrated to cooperate and operate in domestic, condominium and outdoor environments, appropriately equipped with AmI Infrastructure. The level of robotic services is effectively enhanced thanks to the inclusion of cooperative robots that are able to contemporarily act in indoor and outdoor environments, and of the AmI infrastructure, fully integrated in domestic and urban contexts that facilitates the operations of robots, provides effective tools to supervise the various scenarios and ensures safe operations, and connects users (elderly people and caregivers), service providers (social services, medical centres, municipalities, shops, pharmacies, etc.) and robots (domestic, condominium and outdoor). Thanks to its multidisciplinary approach, the Robot-Era Project gained interesting results in fundamental scientific and technological challenges in robotics and ambient intelligence technologies, robotic architectures, elderly user-needs, design for acceptability and legal/insurance regulations and standards for real deployment. Two pilot sites, in Peccioli (Italy) and Örebro (Sweden), are under development as a framework to facilitate cross-fertilisation between university, industry and stakeholders in the development, experimentation and deployment of robotic systems, capable of providing useful services to citizens and local municipalities. The design and development of robotic systems and AmI Infrastructure is based on the analysis of the affordance (immediately show its functionalities), safety (perceived safe), aesthetics (perceived familiar with an opportune combination of colors and soft / rigid materials), friendliness (emotionally accepted), usefulness (concretely useful in daily activities) and dependability (robust, effective and reliable). The approach of Robot-Era is oriented to a “3D Robotic Services” concept that perfectly fits with the main themes and issues of Social Robotics.

## Renaud Ronsse


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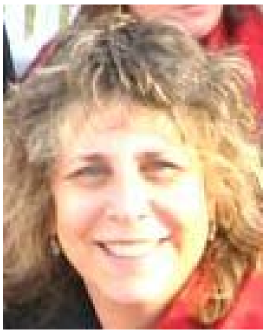
Biography Renaud Ronsse received the M.Sc. (Electrical engineering) and Ph.D. (Engineering) degrees from the Université de Liège, Belgium, in 2002 and 2007, respectively. His thesis focused on the control of rhythmic movements involving hybrid dynamics (impact juggling), investigating control issues both with the robotics and human motor control viewpoint. In 2007-2009, he did a postdoc at KULeuven (Belgium), engaged in the research on behavioral and neural mechanisms involved in bimanual coordination (behavioral and fMRI). In 2009-2010, he took another postdoctoral fellowship at the Biorobotics Laboratory, EPFL (Switzerland), to work on control and experiments in rehabilitation robotics. In 2011, he joined the Center for Research in Mechatronics, Université catholique de Louvain, Belgium, as Assistant Professor. His research interests lie at the intersection between robotics and human motor control, with a particular focus on assistive and rehabilitation robotics.


Abstract **Primitive-based entrainment in upper- and lower-limb periodic movement assistance by using adaptive oscillators**

Motor primitives were initially identified in animals as a library of basis movements, providing an elegant way to account for learning, adaptation, coordination, and modularity. Indeed, assuming that simple and fundamental movements are coded within primitives, any complex behavior can be decomposed into a coordinated set of time- and space-modulated primitives. As a consequence, executing a complex movement reduces to the proper coordination of the necessary primitives, requiring a much smaller number of control parameters than required to code the original movement from scratch. A similar reasoning applies for learning, and indirect proofs of existence of these mechanisms were found in humans as well. In robotics, the use of motor primitives to learn and execute complex movements has gained a lot of attention within the last few years. In particular, robotic applications requiring close interaction with humans often necessitate the planning and/or modulations of complex movements on the fly, to properly and safely react to human behavior. In that context, the use of motor primitives offers a lot of flexibility and reactivity, by coding complex and human-like movements within a limited number of parameters. A well-developed way of coding motor primitives for robotic applications is through dynamical systems, offering complementary advantages, directly inherited from the properties of the dynamical systems primitives are made of, regarding stability to disturbances, multi-joint coordination, etc... Since motor primitives were first identified in biological agents, and secondly used as an efficient framework in biologically-inspired robotics, it seems very appealing to investigate their relevance in a field which lies

at the intersection of both, namely rehabilitation robotics. In this talk, recent research showing how primitive-based controllers can efficiently assist cyclical upper- and lower-limb movements will be surveyed. In particular, the proposed approach builds upon attractive properties of a particular class of dynamic motion primitive, namely adaptive oscillators. Adaptive oscillators are systems having the capacity to achieve input-output synchronization while learning the input features (frequency, amplitude, etc.) in dedicated state variables. As such, the proposed method for movement assistance is trajectory-free, in the sense that it provides user assistance irrespective of the performed movement, and requires no other sensing than the assisting robot's own encoders. First, two experiments validating this approach will be presented: a simple sinusoidal movement of the elbow that was designed as a proof-of-concept, and a walking experiment by using the LOPES platform. In both cases, evidences illustrating that the healthy participants were actually assisted during movement execution will be presented. Owing to the intrinsic periodicity of daily life movements involving the lower-limbs, we postulate that this approach holds promise for the design of innovative rehabilitation and assistance protocols for the lower-limb, requiring little to no user-specific calibration. Second, theoretical results establishing synthesis rules for adaptive oscillators will be overviewed. Proper synthesis allows tuning the oscillator dynamics to the desired performances. Finally, some perspectives on ongoing research projects will be given, with a particular focus on preliminary studies with post-stroke patients and lower-limb amputees. We will emphasize the criticalities appearing when translating an assistive approach for healthy subjects to a rehabilitation or assistive protocol for people with disabilities.



## Sara Rosenblum
## Working Group Chair
## Sessions III and IV (12 June)

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Biography Sara Rosenblum is an associate professor in occupational therapy and head the laboratory for Complex Human Activity and Participation (CHAP), with special interest in the characteristics of human daily function. Rosenblum aim to gain better insight into interactions between varied body functions (e.g., cognitive, motor, sensory), activity performance and participation abilities of people faced with functional deficits in everyday life. A main focus is placed on trying to understand the relationships between brain mechanisms and actual daily functions among varied populations along life cycle. The ICF concepts (WHO, 2001) constitute the frame for description and evaluation of ability and disability in her research. Consequently, her studies concentrate on populations of children and adults with Hidden disabilities such as ADHD, DCD, LD, and those with chronic illness whose daily function confrontations have not yet received appropriate expression in research.

Abstract **Brain-hand language secrets as reflected through a computerized system**

Brain-hand language secrets as reflected through a computerized system and their possible contribution to the field of social robotics. The field of social robotics is in its developing stage while questions regarding how to design and build social robots are being discussed. Consequently, there is no clear insight as to the possible impacts of this development on the therapeutic domain area, although some literature describes robot therapy for people with special needs. In this context, interdisciplinary research which combines diverse sources of knowledge may enrich the development process of social robotics. The aim of this presentation is to exhibit knowledge acquired within the occupation science concerning human performance characteristics of participants with ‘clumsiness’ diagnosed by the DSM4 as Developmental Coordination Disorders (DCD). Specifically, features of children's and adults with DCD performance of a specific task which reflects brain-hand language, in other words, handwriting, will be presented. Information about their handwriting performance features was gathered using the Computerised Penmanship Evaluation Tool (ComPET) which detects the writing process, as well as supplementary self report questionnaires. Studies were conducted with 180 participants, 90 children and adults with DCD compared to 90 children and adults with Typical Development (TD). Results indicated that the temporal spatial and pressure measures of participants with DCD handwriting performance differed significantly from those of TD participants. Furthermore, several handwriting features predicted their Activities of Daily Living (ADL) performance level. Results such as these shed light on the meaning of motor coordination deficits to participants with DCD (clumsiness) daily function and may constitute a

source of knowledge for social robotic development to improve their motor function, automaticity and control. Furthermore, it may particularly contribute to improving handwriting performance enabling more effective brain hand language expression. Possible implications for the social robotics field will be described with focus on use of computerised information to develop robots for evaluation and therapeutic intervention among children and adults with DCD, aimed to improve their achievements and quality of life.


## Hicham Atassi

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Biography Hicham Atassi received his BSc in teleinformatics, MSc with distinction in telecommunication and information technology and PhD degrees in teleinformatics from Brno University of Technology, Czech Republic, in 2005, 2007 and 2013, respectively. Currently he is working towards his second PhD degree in the Cognitive Signal Image and Control Processing Research (COSIPRA) Laboratory within the Division of Computing Science at the University of Stirling, Scotland, UK. Since 2009, he has been affiliated with both COSIPRA Lab at Stirling and the Department of Telecommunications, Brno University of Technology. His research interests include, signal processing, machine learning, affective computing and biologically inspired systems.


Abstract **An Autonomous intelligent system for Call Centres Surveillance and Assessment**

There is a huge boom of call centres worldwide, with an ever growing number of companies operating through phone marketing. The performance of operators in such subjects is of crucial importance in addition to the clients' feedback. However, it is very hard to manually evaluate the quality of services provided, or to assess the agents' performance. For example, if a company has 20 operators working daily for 7 hours, 5 days per week, then the phone calls recorded over one month make about 2800 hours. Since it is impossible to manually check all these phone calls in order to form a reliable image of agents' performance or to assess the quality of services. In the light of this, it appears evident that some kind of an automatic analysis of speakers' characteristics is indispensable for phone-marketing and indeed all subjects that involve customer support services in their structure. In this presentation, we will present a new autonomous intelligent system for call centres surveillance and assessment. The system is based on advanced speech processing techniques aiming to recognize multiple speakers' characteristics such as emotional state, age and gender. The system is also capable of analysing the dialog between the customer and the agent. A special focus of this talk is on the vocal emotion recognition aspects, where a number of proposed approaches based on both classification and regression will be presented. Finally, a new method for mapping emotions in the two dimensional space is also introduced.


## Tatsuya Matsui

| | |
|---|---|
| Organisation | Flower Robotics Inc. |
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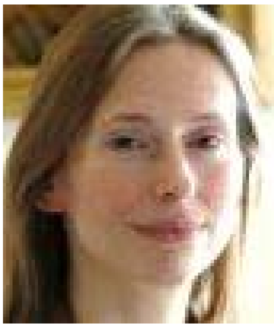
| Biography | Founder of Flower Robotics Inc. Robot designer. |



Abstract

**Design approach / For the robot to be accepted in the society.**

Ahead, in order for the robot to be accepted by society, there are various stages. I would like to discuss herein the term "robot", which is not a robot working in limited locations in factories, but among the general public to coexist with humans. To that end is a "robot". It is necessary to locate accurately the demands of society for the development and planning of robots. In order to co-exist with people, it is important that they have the "appearance to convey properly their function" and "ease of use". Robot design as an interface that connects people and society to the robot is important.This time, we have developed and sold a mannequin robot that is accepted by society, and we explain the importance of robot design in order to be accepted in and by society.



## Claudia Pagliari

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Biography Claudia leads the Interdisciplinary Research Group in eHealth at the University of Edinburgh and a Masters programme in Health Informatics. Her research uses cross-disciplinary approaches to study and evaluate digital health innovations, including consumer-centred tools and services, such as telehealth and mHealth for chronic disease management and personal electronic health records. She is also involved in research examining public engagement in the digital society, such as the acceptability of record linkage for research, policy or commercial purposes. Although she has worked in medical schools for over 15 years, her parent discipline is psychology and she is particularly interested in social scientific issues associated with the design, implementation and impacts of ICT.

Abstract **Roles, relationships and rights in interactions between real and virtual humans: insights and implications from a study on Avatar-supported eHealth**

Help4Mood is an EC FP7 project to design and evaluate a system for helping patients to monitor and report their symptoms of depression with the aid of a virtual humanoid agent. This presentation will reflect on our experience of the multidisciplinary design process and our qualitative research with users to raise issues around expectations, trust, communication and relationships in the human-nonhuman interaction space. The implications of using robot and robot-like mediators in the context of eHealth for vulnerable groups will also be considered.

## Vanessa Evers

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Biography Vanessa Evers is a full professor of Computer Science at the University of Twente's Human Media Interaction group. She received a Ph. D. from the Open University, UK; she has worked for the Boston Consulting Group, London and later became an assistant professor at the University of Amsterdam's Institute of Informatics. She was a visiting researcher at Stanford University (2005-2007). Her research interests focus on on interaction with intelligent and autonomous systems such as robots or machine learning systems as well as cultural aspects of Human Computer Interaction. She serves on Program Committees of HRI, CHI, HSI, CSCW and ACM Multimedia. She is co-chair of the ACM International Human Robot Interaction Steering Committee and in the Editorial Board of the Human Robot Interaction Journal.

Abstract **Human Robot Co-existence**

The realization of Robot Companions that interact socially with people will lead to profound modifications of our society, and ultimately will lead to a new form of society: a Hybrid Society of Humans and Robots. We need a new interdisciplinary mix of computer and social and psychological science to understand such a Hybrid Society, and the substantial societal impact robots will have in terms of new welfare, new forms of social relations and interactions, as well as new market opportunities. These are accompanied by new legal and ethical challenges. At the core of thius stands the detailed investigation of the interaction between humans and robots The realization of Robotic companions will offer a unique opportunity to computer science, social sciences and the humanities (e.g., social signal interpretation, behaviour modeling, sociology, anthropology, economics, linguistics, law, ethics, social-psychology) to perform experimental studies of individual-level as well as large-scale societal phenomena and their ethical and legal consequences and implications. Pursuing these studies has relevance not only for the hybrid society of the future but also for the understanding of human society as we know it, and so they have the potential to revolutionize social sciences at large. The proposed research direction is based on three antecedents that give hints on how to design such a technological infrastructure to support everyday life. (1) The media equation that postulates that humans respond to a new technology as if it were a social actor (Reeves and Nass, 1996). (2) The work on moral accountability in ethics (Cheng, Kahn, Kanda, 2012; Nourbahkhs,2009). (3)The work on acceptance of social robots (heerink et al 2010; Tscheligi et al, 2012), (4) Social Signal Processing (Perez, 2012) and (5) Human agent social dialogue. We will describe in our presentation how to combine and expand these approaches into an experimental hybrid sociopsychological, ethics and law method and distributed environment

that will help settle three problems that currently plague social sciences and law, by: (i) Social scientists will be offered a unique window into the emergence of human behavior toward novel forms of autonomous Robots, social interactions, cultural differences, public attitudes and opinions, communication and interaction patterns, social norms and conventions. (ii) Social scientists will be able to experimentally manipulate the critical variables that regulate human-robot communication and social phenomena. (iii) Ethicists can develop new principles and guidance on the basis of scenarios of future deployment. (iv) Legal experts can translate the implications of scenario's of robot-Human interaction into new regulatory frameworks that can pave the way for future deployment of robots that proactively take account of consumer interest and contribute to the innovation and acceptance of social robot companion technology in society by finding a balance between protection, security and innovation. Combining scientific effort with the realization of living lab locations where robots are deployed with users in their real-world homes and workplaces makes investigation of a future hybrid society possible. designers in their approach to such a complex field.

## Milan Gnjatović


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Biography Milan Gnjatović is postdoctoral researcher at the University of Novi Sad, Serbia. He received the PhD degree in computer science from Otto-von-Guericke University Magdeburg, Germany, in 2009, where he has also worked as a research assistant in the Department of Knowledge Processing and Language Engineering. His research interests include adaptive dialogue management in human-machine interaction, cognitive technical systems, affective computing, and natural language processing. He participated in several interdisciplinary research projects in the field of human-machine interaction, and was a member of the COST 2102 International Scientific Committee. Currently, Milan Gnjatović is the leader of the subproject "Multimodal Human-Machine Dialogue", within the interdisciplinary research project "Design of Robots as Assistive Technology for the Treatment of Children with Developmental Disorders", funded by the Ministry of Education and Science of the Republic of Serbia.


Abstract **The Child, the Therapist, and the Robot: Adaptive Dialogue Management in Three-Party Interaction**

This talk is part of the interdisciplinary research project "Design of Robots as Assistive Technology for the Treatment of Children with Developmental Disorders". This project integrates three fields of research: (i) robot design, dynamics and control; (ii) human-machine interaction, adaptive dialogue management and simulated cognition; and (iii) medical treatment of children with developmental disorders. The aim of the project is to design and develop a prototype robot to be used as assistive technology in the therapy of children with developmental disorders (e.g., cerebral palsy, language impairments, etc.). In this talk, I focus primarily on the research question of adaptive dialogue management in the three-party interaction between the child, the therapist and the robot in the context of the therapy of children with receptive language difficulties. The language faculty is a fundamental feature of humans that has an important role both in social phenomena and in the construction of an individual's identity. It is reasonable to expect that the robots' capacity to engage in a natural language dialogue may contribute to a great extent to establishing long-term social relations to robots. This is particularly significant for the robot-assisted therapy of children with developmental disorders, where one of the most crucial factors that determine the efficacy of the treatment is the child's motivation to undergo a long-term therapy. From the perspective of social interaction, the robot's engagement in a therapeutic dialogue is aimed at establishing affective attachment of the child to the robot. From the functional perspective, it is aimed at assisting with therapy-specific activities that are often characterized by continuing or repeating behavior

(e.g., various language-related exercises, etc.). The functional requirements address both the analytical and generative aspects of the robot's dialogue behavior. The analytical aspect relates to the research question of capturing the meaning of the spontaneously produced user's linguistic inputs. The users should not (and sometimes cannot) be forced to intentionally adapt their dialogue acts to a preset grammar. Instead, they should be allowed, as far as possible, to express themselves naturally. The embodied conversational agent should be able to cope with different syntactic forms of spontaneously produced users' input (including ellipses, context-dependent utterances, ill-formed inputs, etc.). Furthermore, in the observed interaction scenario, the child and the therapist share the linguistic and spatial contexts. Thus, the conversational agent should be able to robustly process linguistic inputs that instantiate different encoding patterns of motion events (e.g., bipartite and tripartite spatial scene partitioning, etc.) and spatial perspectives (e.g., user-centered frame of reference, etc.). The generative aspect relates to the research questions of adaptive dialogue management and generation of appropriate dialogue acts. The underlying idea is that the conversational agent dynamically adapts its dialogue strategy according to the current context of the interaction. The context of the interaction includes a set of interaction features, such as the meaning of the user's linguistic input, attentional information, the state in the spatial context, the emotional state of the child, etc. The additional level of the conversational agent's adaptability is achieved by giving the therapist the possibility to redefine the interaction context and the dialogue strategy at any moment. At the methodological level, this talk reports a cognitively-inspired representational approach to meaning in machine dialogue. To the extent that it is representational, this approach proposes a nonstatistical, computationally and analytically tractable model with the explanatory power. To the extent that it is cognitively-inspired, this approach draws upon and integrates insights from behavioral and neuroimaging studies on working memory operations and language-impaired patients (i.e., Broca's aphasics). I discuss the implementation of this model within a prototype conversational agent that manages the three-party interaction between the users and the robotic system. Finally, using a robot as assistive technology for the treatment of children with developmental disorders raises significant ethical issues. I briefly refer to some of them in the conclusion. (Acknowledgment: The presented study was sponsored by the Ministry of Education and Science of the Republic of Serbia under the Research grants III44008 and TR32035.)

## Sonya Meyer


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Biography Sonya Meyer (MSc) is an Occupational therapist and doctoral candidate at the University of Haifa. Sonya is a clinician and a researcher. Clinical work at a child development center focuses on children with a wide range of developmental delays (e.g. cognitive, motor, sensory and communication). Therapy aims at enhancing participation in diverse areas of occupations and changing environments in everyday life. Research focuses on children with chronic conditions (e.g. celiac) aiming to deepen the understanding of influence of chronic conditions on quality of life and well-being. The ICF concepts (WHO, 2001) constitute the framework for exploration of daily function with special interest in confrontations not yet expressed appropriately in research. Deeper understanding of the needs of this population will enable development of assessment tools and intervention programs, supporting participation in everyday activities adapted to people living with chronic conditions throughout childhood.


Abstract **Social Robots as possible Celiac Disease management mediators for supporting adherence to a healthy lifestyle**

Human – robot interaction research is continually developing and maturing to a point where interactive systems can be built to provide people support for specific needs in daily life such as health care and improve adherence to health regimen. Possible applications could be in health related domains such as chronic disease management. People with chronic health conditions may have difficulty adhering to health care recommendations. Research has revealed that children with chronic illness have a need for an educator to teach them about their chronic disease, a motivator to change and a buddy that is a companion in coping with the disease. Furthermore, it has been suggested that social robots may help children in their daily healthcare related activities such as adherence to dietary requirements. Celiac is a chronic autoimmune disease precipitated by exposure to gluten and is characterized by inflammatory damage to the small intestine due to difficulty in ingestion of gluten (wheat, barley and rye). A lifelong adherence to a strict gluten free diet is the only treatment known today. Adaption to a gluten free diet, involving strict dietary limitations can be difficult, has financial implications and may be harmful to the patients' quality of life (QoL). Non-compliance to a gluten free diet may have a wide range of short and long term medical implications. Therefore, diet adherence is of considerable importance and change of lifestyle is a major component of the disease management. The challenging burden of the management lies on those diagnosed with the disease. The aim of this presentation is to present understandings and future ideas of the health related quality of life of 46 children aged 8-18 years with Celiac measured by a disease-

specific health-related QoL questionnaire for children with Celiac and their parents (CDDUX). Results reflected significant difference between the children's and parent's reported QOL. Namely, the parents perceive their children's QOL to be significantly more negative than the children's self perception. Nevertheless, the children rated their Health related QoL as less than good. These results may implicate the unfulfilled need for support. Questions associated with communicating about Celiac yielded the children's highest ratings, emphasizing the positive role of the social interaction in daily life with Celiac. The social robotics field may encompass development opportunities of assistive technology mediators suitable for healthcare adherence intervention among children with Celiac designed to improve QoL.

## Hideki Kozima


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Biography Hideki Kozima is a professor of School of Project Design, Miyagi University (Miyagi, Japan). He has received his Ph.D. in computer science and information mathematics from the University of Electro-Communications (Tokyo, Japan) in 1994. From 1994 to 2008, he was Senior Research Scientist at National Institute of Information and Communications Technology (Kobe and Kyoto, Japan). From 1998 to 1999, he was a Visiting Researcher at MIT AI Lab. From 2008, he has been with Miyagi University, working on research and education on interactive robots, human-robot interaction, cognitive and developmental psychology.

Abstract **Social robot for autism therapy**


Autistic children, in general, have difficulties in exchanging and sharing intention and emotion with others through nonverbal information, and delay in language development, especially of pragmatic use of language. In spite of these difficulties in social interactions, autistic children are relatively good at interacting with physical objects. Though their interest and actions are often restricted to specific aspects, autistic children are generally good at understanding and manipulating things as physical systems. This implies that information processing for objects (systemizing) and that for people (empathizing) are somewhat independent. Robots can be seen either (or both) as physical systems or as human-like agents with mental states. So, robots could provide autistic children with opportunities to experience social interactions with agents through physical interactions with systems. Based on this idea, we developed a simple robot, Keepon, which was designed to express only attention (by head orientation) and emotion (by simple body movements), so that autistic children could intuitively read its mental states, not being overwhelmed by complicated facial expressions, body gestures, or speech. Keepon is a simple physical system that expresses various amount of social information. For the past several years, we have been using Keepon as a mediator of social interaction at a daycare center for autistic children. Keepon, being tele-controlled by an operator (researcher or therapist), performed interactions with autistic children in their daily therapeutic environment. The longitudinal interactions showed that the minimally designed robot would be an useful tool for therapeutic interventions. Also, the video data recorded from Keepon's subjective viewpoint (of the onboard camera) have been analyzed and utilized by the practitioners, such as pediatricians and psychiatrists, as well as the parents of the children for sharing and exchanging understandings of each child.

## Frano Petric


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Biography Frano Petric (M.S.E.E) was born in 1988 in Imotski, Croatia, where he received primary and secondary education, during which he participated in numerous mathematics and physics competitions. In 2007 he started studying at the Faculty of Electrical Engineering and Computing, University of Zagreb. After finishing his undergraduate studies in 2010, he enrolled in the graduate program at the same institution. He received the Rector’s Award in 2012 for work on walking robots. He graduated under the supervision of Professor Zdenko Kovačić in July of 2012 with highest honors (summa cum laude). In October of 2012 he started working in Laboratory for Robotics and Intelligent Control Systems (LARICS) at the Department of Control and Computer Engineering. He is now a PhD student with a scientific focus on social robotics, but is also working on other projects in which the LARICS is involved. His other interests include navigation of autonomous systems, walking robots and computer vision.


Abstract **Application of Humanoid Robots in Diagnostics of Autism**

In our current research, we explore the possible role of humanoid robots in diagnosing autism spectrum disorders (ASD). This research, being a joint effort of researchers from education and rehabilitation sciences on one side and electrical engineering and computing on the other, is expected to answer two major questions. From the educational and rehabilitation standpoint, it is interesting to explore if the use of robots can improve the diagnostic process and remove the bias introduced by a human examiner. While seeking an answer to this major question, we can answer some related questions too, like how people react to robots or what features must a robot have to initiate interaction with people with ASD. These related questions can then spark new research towards the employment of robots in teaching or even intervention for people with ASD. From the technical standpoint, human-robot interaction is perceived as one of the most interesting topics in robotics these days. Through this research, we seek to formulate technical requirements and develop functionalities for a robot that would be able to engage in bidirectional interaction through some of the basic channels of human communication in a robust way. For this purpose we are using NAO humanoid robots of Aldebaran Robotics. Through an experiment, which is designed to focus on and initiate a specific type of communication, we seek to validate the developed functionalities in order to assess the possibility of using robots in teaching children with ASD. We hope that such research will give us more insight into the topic and form a foundation of new research directed towards the use of robots in teaching and intervention.

## Alicia Casals
## Working Group Chair
## Sessions V (13 June)


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Biography: Her background is in Electrical and Electronic Engineering and PhD in Computer Vision. She is professor at the Technical University of Catalonia (UPC), in the Automatic Control and Computer Engineering Department. She is currently leading the research group on Robotics and Medical Imaging program of the Institute for Biomedical Engineering of Catalonia (IBEC). Her research field is in robotic systems and control strategies for rehabilitation, assistance and surgical applications. Responsibilities: 2001 to 2008 Coordinator of the Education and Training key area within Euron, European Robotics Network, 2008-2009 IEEE-Robotics and Automation Vice President for Membership. Main awards: International Award on Technology, Barcelona'92, Barcelona City Award 1998 (Barcelona City_Hall), and Narcis Monturiol Medal from the Catalan Government as recognition of the research trajectory 1999. From 2007 Prof. Casals is member of the Institut d'Estudis Catalans, the Academy of Catalonia.


Abstract: **Social acceptance factors in robotics for health**

As robots have been widening its scope, moving from industry to hazardous environments, to services, leisure and entertainment, and even to personal and medical assistance, the need of endowing them with some kind of "human qualities" arises. The interaction of humans and robots demands flexible behaviors, so that robots adapt to the human needs and dynamically to the situation requirements. If conceived for professional use, robots must provide an added value through their effective, reliable and safe operation. But if they are oriented to personal use, leisure, assistance or care, they should offer additional performances, behave in accordance to the users' will and in the way users may expect they should react to any situation. Thus, social robots should appear friendly and behave compliantly, cooperatively and if it applies, showing some comradeship. This more human like behavior requires, among other performances, various levels of perception, decision making and planning capabilities, cosmetic appearance, compliant behavior and a friendly interface to be understandable and usable for elder and non-specialists. Therefore, besides being provided with the necessary sensing modalities this information has to be adequately processed to interpret the operating environment, the evolution of the task or process, and through the human –robot interaction system, interpret human intention, human will and the suitability to cooperate. That is, endow the robot with some kind of "human qualities". However, the diversity of natural environment conditions and their complexity impedes achieving a robust enough interpretation or disambiguate among different environment situations,

human actions, objects with which to interact, etc. Thus, additional information may be required that can come from the knowledge of the evolution of the task going on through an analysis of both, human and workflow activity. The increasing requirements of these more and more demanding social needs may lead to complex and costly social robots and robotic systems, which may result in an economically unsustainable manufacturing. Thus, the goal of this talk is to analyze in the area of robotics for health, comprising the fields of surgery, assistance and rehabilitation, the current situation of robotics and foresee how robotic systems should evolve towards this end that is, becoming assistance machines, invisible assistants or collaborative and assistant mates. With this aim, in this talk the three kinds of barriers that prevent the spreading of robots in the wide scope of services, focusing mainly to health, will be evaluated. These barriers are: technological difficulties, formal issues and user's acceptability. Technological difficulties can present quite different levels as technical aids range from very simple devices to extremely challenging systems, and among the latter, some difficulties may depend on the burden of bulky and costly systems or on the still unsolved technical solutions. For this reason an evaluation of some current robotic aids will show design criteria and their cost-effective results. Dealing with robots interacting with humans, special efforts should be devoted to evaluate the compromise between the required robot assistance and the potential degree of cooperation so as to extract the best of human –robot synergies. The design of sustainable solutions as robots spread around will be another aspect to be considered. Referring to formal issues, here we refer to administrative and legal aspects which unfortunately are creating fictitious barriers that lead to unreasonable orientation of research, development and marketing efforts. Besides administrative and legal aspects that should adapt to the progress of technology, as current robots are very different from former manufacturing machines, other factors as the overwhelming of patents is an factor to be taken into account. Patents range from those reasonably protecting technology that results from serious research, to many others which are abusive without presenting any real innovation, those that just try to prevent new technological and improved developments in order to protect interests of some lobbies against the interest of society. And finally, referring to acceptability, the analysis of current robotics applied to health will be the base of discussion on how to approach users offering them just what they need in what refers both to the service or assistance offered and to its acceptability. In the medical area, as in other areas, acceptability refers to usability, robot appearance, cost-effectiveness and ease of use, matters to be dealt with along the talk.

## Thierry Keller


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Biography Thierry Keller received his Dipl. Ing. degree in electrical engineering (M.Sc.E.E.) and his Doctorate (Dr. sc. Techn.) from the ETH Zurich, Switzerland in 1995 and 2001, respectively. Currently, Dr. Keller is the head of the Rehabilitation Department in Tecnalia Research & Innovation, the largest private research center in Spain. Main activities of the Rehabilitation Department are in rehabilitation and prevention, on innovation and development of novel technologies for rehabilitation robotics, tele-rehabilitation, technologies for physical and cognitive prevention, and neuroprostheses. Dr. Keller is principal investigator in national and international projects and coordinator of the EU COST action TD1006: European Network on Robotics for Neurorehabilitation. Dr. Keller is board member of the International Functional Electrical Stimulation Society (IFESS), and member of the steering committee of the International Industry Society of Advanced Rehabilitation Technologies (IISART).


Abstract **Robotics for Neurorehabilitation: Current challenges and approaches**

Neurorehabilitation specifically after stroke requires more user involvement and time than the duration of their hospitalization. Continuation of the therapy in local and smaller rehabilitation facilities and at home should follow the clinical rehabilitation. One of the current challenges for rehabilitation engineers are the implementation of affordable rehabilitation systems for outpatient centers and the development of cost effective solutions for home environments. This goal can be achieved by combining robotic devices with a tele-rehabilitation platform. They promise to maximize benefit and availability to the patient, and to simultaneously minimize long-term care costs to the health care system. Key for such platforms are the integration of all stakeholders needed for the rehabilitation success, mainly the interaction of the therapists, the family caregivers, the clinicians and the robotic systems with the patient. A rehabilitation and care continuum needs to be enabled on which social robotics components and interactions are needed. From this scenario many needs and challenges can be derived, which drive the activities of the COST Action TD 1006 ‘European Network on Robotics for Neurorehabilitation’. The main goals are: • To provide clear, evidence-based guidelines for patient selection and application of robot- aided therapy. • To coordinate research necessary for understanding factors influencing recovery processes after stroke. • To recommend desirable features of new and efficient robot-based therapies, taking into account future application scenarios (e.g. neurological conditions other than stroke, decentralized domestic tele-rehabilitation). A number of activities are currently undertaken by an

interdisciplinary group of clinicians, engineers, motor control experts and neuroscientists: • Summarize and catalogue established research results on robot-aided therapies. Formulate evidence-based guidelines for the application of robot-aided therapies in clinical practice. • Summarize and catalogue established research results on robot-aided assessment of patient capabilities. Clarify how robot-aided assessment procedures are related to existing clinical scales. • Identify disabilities and diseases for which robot-aided therapies represent potentially beneficial treatments. • Identify patient and therapy parameters, which are important for theoretical modeling of motor recovery. • Discuss the relation between models of sensorimotor learning and models of motor recovery. • Discuss results of ongoing clinical trials and experiments about the neurophysiological mechanisms of motor recovery. • Plan and coordinate future experiments and clinical trials. • Share datasets recorded in experiments studying the neurophysiological mechanisms of motor recovery. • Compile a repository of software tools for modeling motor learning and motor recovery. • Identify key features of future rehabilitation robots from an analysis of established research results, experience with clinical use of robots, and ongoing research programs. • Identify emerging technologies, which could be of use in future rehabilitation robots. • Recommend future research directions for the technological development and clinical application of rehabilitation robots. All these activities will help to make robot-mediated therapies more and more clinically used and accepted. Recognizing that two of the key barriers to quality care are therapist time and cost, and that the size of the barrier is expected to increase threefold with the coming shift in the demographic profile, new robotics treatment tools and modalities to further increase the efficiency and availability of rehabilitation and care are needed at a global level. However to be able to achieve full acceptance of robot-mediated therapy requires social acceptance and integration in addition to clinical evidence. Here an additional focus needs to be considered on which the community of social scientists is invited to contribute.

## Peter Friedland

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Biography Peter Friedland received his PhD in Computer Science from Stanford in 1980 for pioneering artificial intelligence research in the areas of planning, knowledge representation, and expert systems. He also co-founded two companies while at Stanford: IntelliGenetics (bioinformatics) and Teknowledge (expert systems). In 1987, Dr. Friedland joined NASA Ames Research Center to create the US government's largest and most highly-regarded Intelligent Systems laboratory. He left Ames in 1995 to form and lead his third company, Intraspect Software, an early knowledge management systems provider. Dr. Friedland rejoined Ames in 2003 as Chief Technologist where he supervised a wide range of technology development activities. He is now an independent technology strategist and consultant. Dr. Friedland is a Fellow of the AAAI, and a recipient of the NASA Outstanding Leadership Medal and the Feigenbaum Medal for Expert Systems Applications.

Abstract **Developing Trust in Human-Machine Interaction**

Trust is an essential component of any team of intelligent agents, whether human, robotic, or (of greatest interest to this workshop) mixed. Traditionally we build trust in our non-human agents by prior validation of all possible activities. However, that is neither possible or desirable in situations where we expect our robotic agents to learn and improve over time, by interacting both with their environment and with other human and robotic agents. The topic of human-machine trust is inherently inter-disciplinary, involving expertise in computer science, cognitive science, and psychology. This talk will discuss highlights of that ongoing research that includes modeling and representing trust, communicating trust, integrating trust into reasoning systems, and validating trust. In addition, the talk will describe a new extension to the program that will focus on determining the effectiveness of human-like behavior, appearance, and affect by robotic agents in building human-machine trust.

## Marcos Faundez Zanuy


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Biography Born in Barcelona, Spain. He received the B.Sc. degree in Telecommunication in 1993 and the Ph.D. degree in 1998, both from the Polytechnic University of Catalunya. He is now Full Professor (catedrático) at EUP Mataro (Tecnocampus) and heads the Signal Processing Group there (Grup de recerca consolidat GRC-1318, grupo de investigación consolidado (2009)). Since 2009 he is the dean of Escola Universitaria Politecnica de Mataró (Polytechnic University of Catalunya). Since 2010 he is responsible of research at tecnocampus. His research interests lie in the fields of biometrics applied to security and health. He is author of more than 40 papers indexed in ISI Journal citation report, more than 100 conference papers, around 10 books, and responsible of 10 national and european research projects.

Abstract **Xnergic: a Tecnocampus initiative to promote engineering vocations**


Engineering vocations have experimented a dramatically reduction in the last years. This is a major problem and several programs have appeared to deal with this situation. In a wider approach e-skills week 2012 [1] is a program of European Union that concerns about Youth unemployment in Europe, which has peaked at record levels and shows little sign of slowing. Against this dramatic backdrop and the potential for a lost generation in Europe, in March 2012 the European Commission launched a campaign with leading stakeholders aimed at raising awareness about opportunities for work that can be won through the acquisition of e-Skills. It also puts emphasis on young entrepreneurial talent who have used their creativity and energy to start up their own technology businesses. Xnergic is the approach created at Tecnocampus Mataró- Maresme. TecnoCampus Mataró-Maresme is a science and innovation park. It includes three faculties (Polytechnic, Economics and Health), more than one hundred enterprises and a conference center. Current xnergic activities developed to promote engineering vocations can be clustered in two groups: a) Intensive workshops in Christmas, Easter and summer breaks. b) Extensive workhops consisting of three hours each Saturday, as well as one technological conference each month were one professional of the engineering field explains his experience as well as his normal day activities as engineer. In all the groups two kinds of activities are operative (a, b) and two more are under evaluation (c, d): a) Programming workshops based on a program developed at MIT named scratch and Kodu. b) Robotics workshops based on Arduino. c) Computer design and construction of pieces based on 3D printer, laser cutter, etc. d) Audiovisual workshops based on video cameras and postproduction using a computer.

# Organising Committee

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- **Anna Esposito** (Second University of Naples and IIASS, IT)
- **Thierry Keller** (Tecnalia Research & Innovation, ES)
- **Dina Simunic** (University of Zagreb, HR)
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