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Welcome

Welcome to HRI 2016 in New Zealand!

We are excited to welcome you to the Eleventh Annual ACM/IEEE International Conference on Human-Robot Interaction (HRI 2016). The HRI Conference is a highly selective, single track, international meeting showcasing the best research in human-robot interaction, with roots in and broad participation from various communities of scholars, including but not limited to robotics, human-computer interaction, artificial intelligence, engineering, social and behavioral sciences, and design.

The theme of this year's conference is "Natural Interaction," an increasingly important research focus and design goal as robotic technologies become incorporated into everyday life. Achieving natural human-robot interaction requires the input of many technical, social, and design disciplines, as well as reflection on the societal consequences and ethical significance of robotic development. To represent the multitude of disciplines and approaches that contribute to this work and the HRI field more generally in the conference program, we solicited and reviewed papers under four submission themes: "Studies of HRI", "Technical Advancements in HRI", "HRI Design", and "Theory and Method in HRI." Each submission theme was overseen by a dedicated theme chair and reviewed by a dedicated group of program committee members, who worked together with the program chairs to define and apply review criteria appropriate to each of the four contribution types.

The conference attracted 181 submissions from Asia-Pacific, Europe, the Middle East, and North America. Each full paper was aligned with a theme-appropriate subcommittee, and subsequently reviewed through a double-blind process, which was followed by a rebuttal phase, and shepherding where suggested by the program committee. As a result of the review process, the program committee selected 45 (24.8%) of the submissions for presentation as full papers at the conference. As the conference is jointly sponsored by IEEE and ACM, papers are archived in both IEEE Xplore and the ACM Digital Library. Along with the full papers, the conference program and proceedings include the Late Breaking Reports, Videos, Demos, and a new Alt.HRI section. Out of 95 total submissions, 71 (74.7%) Late Breaking Reports were accepted and will be presented as posters at the conference. Eleven (85%) short videos were accepted for presentation during a dedicated

video session from 13 submissions. The program also includes four demos of robot systems that participants will have an opportunity to interact with during the conference. We're very excited to introduce an Alt.HRI session in this year's program, consisting of five papers (selected out of 11 submissions) that push the boundaries of thought and practice in the field. Finally, we have the pleasure of presenting three inspiring keynote speakers who will discuss topics relevant to HRI: Dr. Aude Billard from EPFL in Switzerland, Dr. Mark Sagar from the University of Auckland in New Zealand, and Dr. Robert Sparrow from Monash University in Australia. HRI 2016 was made possible through the significant volunteer efforts of the organizing committee, program committee, reviewers and the Steering Committee. We thank the keynote speakers, financial supporters Honda and Aldebaran, and international reviewers for their support and participation. The conference is sponsored by ACM SIGCHI, ACM SIGART, IEEE Robotics and Automation Society, and is in cooperation with AAI and HFES.

We also want to commend and thank the authors who submitted papers, videos, and demos to HRI 2016, and whose efforts make HRI an exciting field and vibrant community. We hope you will enjoy the conference content, seeing old friends and making new ones, and your visit to Christchurch.



Christoph Bartneck
University of Canterbury, NZ
HRI'16 General Co-Chair



Yukie Nagai
Osaka University, Japan
HRI'16 General Co-Chair



Ana Paiva
IST, University of Lisbon, Portugal
HRI'16 Program Co-Chair



Selma Šabanović
Indiana University, USA
HRI'16 Program Co-Chair

General Information on Christchurch

Christchurch is a small city, that means it sleeps early. Everything except supermarkets close at about 5-6pm. So be fast if you want to do something after the conference.

Cafes, Food, and Points of Interest

Cafes and Food (in walking distance of conference)

- Strawberry Fare (for dessert - expensive but good!)
- C1 Cafe
- Ilex Cafe inside Botanic gardens
- Boat Shed Cafe (Punting Place)
- Ancestral (Korean Restaurant)
- Nando's
- Many Restaurant along Riccarton Road
- Westfield mall food court
- Dux Dine (Seafood and Vegetarian Restaurant)
- Buddha Stix (Chinese Restaurant)

Shopping (in walking distance of conference)

- Re:START Mall (Famous Container Mall)
- Westfield Mall (for a wide variety of stores)
- Pak and Save, Countdown, and New World are the largest supermarkets around town.

Mostly open until 11pm.

Point of Interest (in walking distance of conference)

- Chateau on the Park (Conference Venue)
- Botanic garden
- Punting on the Avon River
- Riccarton Bush (see rainforest inside the bush)
- Canterbury Museum
- Hospital
- ChCh Art Gallery
- Mona Vale
- HITLabNZ
- Re:START Mall (Container Mall)
- Central Bus Station
- New Regent St
- Margaret Mahy Family Playground (great for kids!)
- Cathedral Square

Point of Interest (by bus)

- Willowbank Wildlife Reserve
- Airforce Museum
- New Brighton Pier
- Sumner beach
- Port Hills
- Lyttleton (nice hike over the hill starting at the gondola)

Point of Interest (by car)

- Akaroa Bay (nice small town by the water; lovely place to go kayaking, swim with dolphins, or take wildlife boat tours)
- Quail Island and Diamond Harbour (take boat from Lyttleton)
- Castle Hill (beautiful rocks at the foot of the southern alps)
- Arthur's Pass National park (closest entrance to southern alps from Christchurch with dozens of hiking trails)
- Devil's Punchbowl Waterfalls (near Arthur's Pass information centre)
- Kaikoura (lovely beach town 2 hours north from Christchurch with incredible wildlife including seal colonies, whales, dolphins, and albatross).
- Transalpine Express Train travels from Christchurch on East to Greymouth on the west coast with lovely views of the southern alps along the way)

General transport in Christchurch**Walking:**

The Venue (Hotel) is very central. Therefore, almost everything is in walking distance.

Biking:

Christchurch is very flat as it is located in the Canterbury plains making it quite easy to bike around.

Additionally, bike lanes are on almost every street.

Nextbike is a bike sharing system (only in the center). It costs \$4 NZD for registration and then it is free for the first 30 minutes.

Public transport:

Almost all buses go to the Central Bus Station. From there, you can go to the beach at New Brighton or Sumner, or have a hike at the Port Hills, Lyttleton, or anywhere around Banks Peninsula.

Car tips:

Most cars in NZ have automatic transmission. NZ roads are designed so that one drives on the left like in the UK. AA is the car union in case you have an accident (0800 500 222). If you plan a trip a bit further way, fill up on gas every time you see a station. You never know where the next station will be. The south island is fairly large and sometimes you will only have nature for about 100 km or so.

Conference Venue & Maps

Welcome Reception

The Welcome Reception will take place on Tuesday, March 8, 2016 from 6:45pm-9:00pm at the conference venue in the Camelot Room (see hotel floor plan adjacent).

The conference is taking place at the **“Chateau on the Park”**.

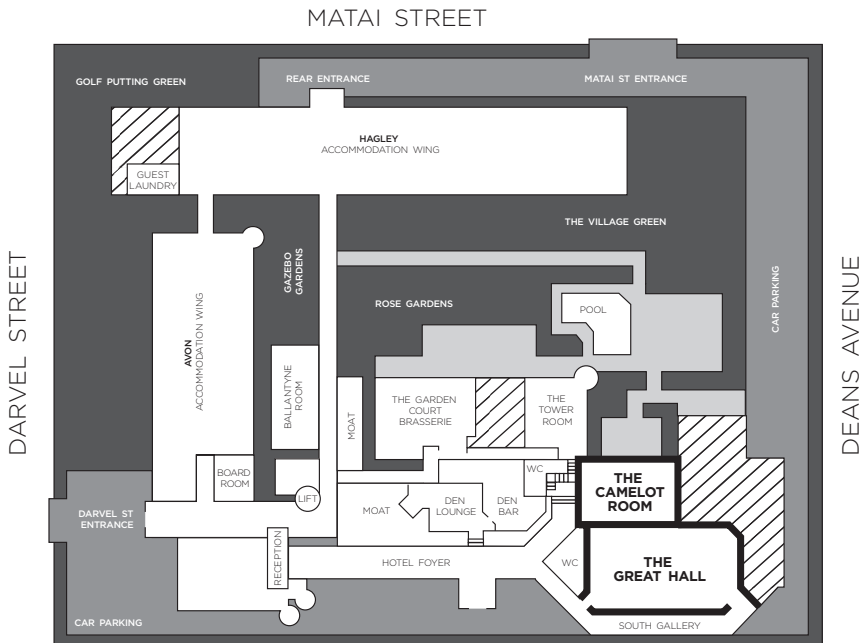
Some useful information:

All of the main conference events will take place in the Great Hall and all the poster sessions will take place in the Chamelot Room.

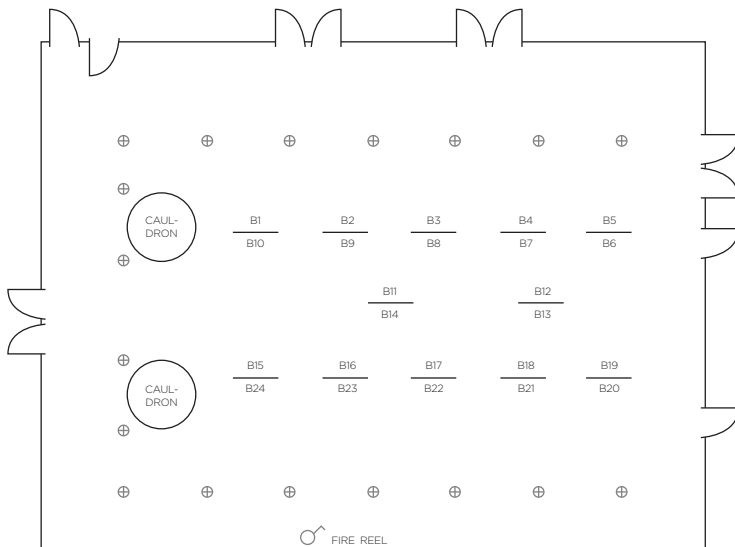
- **Phone: +64 3 348 8999**
- **Email: res@chateau-park.co.nz**
- **Address: 189 Deans Ave, Riccarton, Christchurch 8011**



Hotel Floor Plan



Conference Poster Location



Additional Information

The Conference4me smartphone app provides you with the most comfortable tool for planning your participation in HRI 2016. Browse the complete programme directly from your phone or tablet and create your very own agenda on the fly. The app is available for Android, iOS, Windows Phone and Kindle Fire devices.

To download mobile app, please visit <http://conference4me.eu/download> or type 'conference4me' in Google Play, iTunes App Store, Windows Phone Store or Amazon Appstore.

More information can be found here <http://conference4me.eu/download>

<http://conference4me.com>

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- Access to up-to-date agenda
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- Easy access to conference key information
- Dynamic data synchronization and schedule updates
- Offline functionality
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POZNAŃ SUPERCOMPUTING AND NETWORKING CENTER AND 

Poznań Supercomputing and Networking Center affiliated to the Institute of Electroorganic Chemistry of the Polish Academy of Sciences ul. Stożkowa 12/14, 61-704 Poznań, POLAND. Office: phone center: (48-61) 66-29-00, fax: (48-61) 662-99-54, e-mail: office@man.poznan.pl, <http://www.psnpc.pl>

Program Overview

Day 1 - Monday 7th

08:00 - 08:45	Registration
09:00 - 10:30	Workshop/Tutorial Presentations
10:30 - 11:00	Coffee Break
11:00 - 12:00	Workshop/Tutorial Presentations
12:00 - 13:00	Lunch
13:00 - 15:00	Workshop/Tutorial Presentations
15:00 - 15:30	Coffee Break
15:30 - 18:00	Workshop/Tutorial Presentations

Day 2 - Tuesday 8th

09:00 - 09:15	Chairs's Welcome
09:15 - 09:30	Organization List of Chairs, Committees
09:30 - 10:30	Keynote Speaker Prof. Mark Sagar <i>Making Simulated Faces Come Alive</i>
10:30 - 11:00	HRI Pioneers Poster Session I
10:30 - 11:00	Coffee Break
11:00 - 12:00	Session A Assistive HRI
12:00 - 1:00	Lunch
1:00 - 2:30	Session B Human-Robot Collaboration
2:30 - 3:00	Coffee Break
3:00 - 3:30	Late Breaking Report Session 1
3:30 - 4:30	Alt.HRI
4:30 - 5:30	Videos
6:45 - 9:00	Welcome Reception

Cont...

Day 3 - Wednesday 9th

09:00 - 10:00	Keynote Speaker Prof. Aude Billard <i>Towards Reproducing Humans' Exquisite Dexterity and Reactivity</i>
10:00 - 10:30	HRI Pioneers Poster Session 2
10:00 - 10:30	Coffee Break
10:30 - 11:18	Session C Morality and Trust in HRI
11:18 - 11:54	Session D Teleoperation in HRI
12:00 - 1:00	Lunch
1:00 - 2:00	Session E Companionship and Engagement with Robots
2:00 - 2:30	Coffee Break
2:30 - 3:00	Late Breaking Report Session 2
3:00 - 3:50	Session F Robots that Learn
4:00 - 5:00	Demos

Day 2 - Thursday 10th

09:00 - 10:00	Keynote Speaker Prof. Robert Sparrow <i>Kicking a Robot Dog</i>
10:00 - 10:30	Coffee Break
10:30 - 11:18	Session G Learning with Robots
11:18 - 11:54	Session H Movement in HRI
12:00 - 1:00	Lunch
1:00 - 2:00	Session I Tools and Techniques for Social Robots
2:00 - 3:00	Session J Attitudes and Responses to Social Robots
3:00 - 3:30	Coffee Break
3:30 - 4:00	Late Breaking Report Session 3
4:00 - 4:30	Awards
4:30 - 5:00	Closing Comments

Keynote Speakers



Prof. Mark Sagar

University of Auckland, New Zealand

Making Simulated Faces Come Alive

Tuesday, March 8th



Prof. Aude Billard

EPFL, Switzerland

Towards Reproducing Humans' Exquisite Dexterity and Reactivity

Wednesday, March 9th



Prof. Robert Sparrow

Monash University, Australia

Kicking a Robot Dog

Thursday, March 10th



MONDAY
7TH

Day 1 – Monday, March 7, 2016 Program

08:00 - 08:45	Registration
09:00 - 10:30	Workshop/Tutorial Presentations
10:30 - 11:00	Coffee Break
11:00 - 12:00	Workshop/Tutorial Presentations
12:00 - 13:00	Lunch
13:00 - 15:00	Workshop/Tutorial Presentations
15:00 - 15:30	Coffee Break
15:30 - 18:00	Workshop/Tutorial Presentations

MONDAY 7th

TUTORIAL: Design Skills for HRI

Location: Great Hall 2

Organizing Committee

David Sirkin, *Stanford University*

Brian Mok, *Stanford University*

Nikolas Martelaro, *Stanford University*

Hamish Tennent, *Stanford University*

Heather Knight, *Stanford University*

Guy Hoffman, *Cornell University*

Bilge Mutlu, *University of Wisconsin*

Leila Takayama, *Google*

Wendy Ju, *Stanford University*

Abstract This tutorial is a hands-on introduction to human-centered design topics and practices for human-robot interaction. It is intended for researchers with a variety of backgrounds, particularly those with little or no prior experience in design.

In the morning, participants will learn about needfinding, as ways to understand the stakeholders in research outcomes, guide the selection of participants, and as possible measures of success. We then focus on design sketching, including ways to represent objects, people and their interactions through storyboards. Design sketching is not intended to be art, rather a way to develop and build upon ideas with oneself, and quickly communicate these ideas with colleagues.

In the afternoon, participants will use the tools and materials, and learn techniques, for lightweight physical prototyping and improvisation. Participants will build a small paper robot (not actuated) of their own design, to practice wizarding/puppeteering, explore bodily movement and prototype interactions.

Website <http://designskills.stanford.edu/>

WORKSHOP: 2nd Workshop on Cognitive Architectures for Social Human- Robot Interaction

Location: Great Hall 1

Organizing Committee

Paul Baxter, *Plymouth University*

Greg Trafton, *Naval Research Laboratory*

Séverin Lemaignan, *Plymouth University*

Abstract Social HRI requires robots able to use appropriate, adaptive and contingent behaviours to form and maintain engaging social interactions with people. Cognitive Architectures emphasise a generality of mechanism and application, making them an ideal basis for such technical developments. Following the successful first workshop on Cognitive Architectures for HRI at the 2014 HRI conference, this second edition of the workshop focuses specifically on applications to social interaction. The full-day workshop is centred on participant contributions, and structured around a set of questions to provide a common basis of comparison between different assumptions, approaches, mechanisms, and architectures. These contributions will be used to support extensive and structured discussions, with the aim of facilitating the development and application of cognitive architectures to social HRI systems. By attending, we envisage that participants will gain insight into how the consideration of cognitive architectures complements the development of autonomous social robots.

Website <https://sites.google.com/site/cogarch4socialhri2016/>

WORKSHOP: The challenge (not) to go wild! Challenges and best practices to study HRI in natural interaction settings

Location: Great Hall 3

Organizing Committee

Astrid Rosenthal-von der Pütten,
University of Duisburg-Essen

Astrid Weiss, *Vienna University of
Technology*

Nicole Mirnig, *University of Salzburg*

Selma Šabanović, *Indiana University*

Abstract In the HRI research community, we are aware of all the challenges involved in studying autonomously behaving agents “in the wild”. In order “not to go wild” this workshop shall facilitate discussion on best practices as well as pitfalls in studying robots in natural interaction settings. Specifically, we will focus on challenges in the development of systems for everyday usage in peoples’ homes and on challenges in evaluating these systems in the wild, especially with regard to long-term interaction.

Bringing researchers and industry together, we will discuss and explore common and new methodological approaches to develop robots for the wild and to study HRI outside the lab, and collect recommendations for fellow researchers. In tandem, we want to reflect our visions for the “new era of

socially capable robots” and how we as robot developers and researchers imagine them to integrate into the fabrics of our everyday life.

Website https://www.uni-due.de/sozialpsychologie/hriws2016_robotsinthewild.php

WORKSHOP: Intention Recognition in HRI

Location: Camelot Room

Organizing Committee

Serge Thill, *University of Skövde*

Alberto Montebelli, *University of Skövde*

Tom Ziemke, *University of Skövde*

Abstract The present workshop focuses on the topic of intention recognition in HRI. To be able to recognise intentions of other agents is a fundamental prerequisite to engage in, for instance, instrumental helping or mutual collaboration. It is a necessary aspect of natural interaction. In HRI, the problem is therefore bi-directional: not only does a robot need the ability to infer intentions of humans; humans also need to infer the intentions of the robot. From the human perspective, this inference draws both on the ability to attribute cognitive states to lifeless shapes, and the ability to understand actions of other agents through, for instance, embodied processes or internal simulations (i.e. the human ability to form a theory of mind of other agents). How precisely, and to what degree these mechanisms are at work when interacting with social artificial agents remains unknown. From the robotic perspective, this

lack of understanding of mechanisms underlying human intention recognition, or the capacity for theory of mind in general, is also challenging: the solution can, for instance, not simply be to make autonomous systems work “just like” humans by copying the biological solution and implementing some technological equivalent. It is therefore important to be clear about the theoretical framework(s) and inherent assumptions underlying technological implementations related to mutual intention. This remains very much an active research area in which further development is necessary. The core purpose of this workshop is thus to contribute to – and advance the state of the art in – this area.

Website <http://intentions.xyz/>

WORKSHOP: 2nd Workshop on Evaluating Child- Robot Interaction

Location: Ballantyne Room

Organizing Committee

Manja Lohse, *University of Twente*

Cristina Zaga, *University of Twente*

Vicky Charisi, *University of Twente*

Mark Neerincx, *TNO Human Factors*

Kanda Takayuki, *Advanced
Telecommunications Research Institute
International (ATR)*

Iolanda Leite, *Disney Research*

Abstract Many researchers have started to explore natural interaction scenarios for children. No matter if these children are normally developing or have special needs, evaluating Child-Robot Interaction (CRI) is a challenge. To find methods that work well and provide

reliable data is difficult, for example because commonly used methods such as questionnaires do not work well particularly with younger children. Previous research has shown that children need support in expressing how they feel about technology. Given this, researchers often choose time-consuming behavioral measures from observations to evaluate CRI. However, these are not necessarily comparable between studies and robots. This workshop aims to bring together researchers from different disciplines to share their experiences on these aspects. The main topics are methods to evaluate child-robot interaction design, methods to evaluate socially assistive childrobot interaction and multi-modal evaluation of child-robot interaction. Looking across disciplinary boundaries, we want to discuss advantages and shortcomings of using different evaluation methods in order to compile guidelines for future CRI research.

Website [https://
evaluatingchildrobotinteraction.
wordpress.com/](https://evaluatingchildrobotinteraction.wordpress.com/)

The 11th annual Human-Robot Interaction Pioneers Workshop

Location: Tower Room

Organizing Committee

Jill Greczek, *University of Southern California*

Tiago Ribeiro, *University of Lisbon, Portugal*

Hee-Tae Jung, *University of Massachusetts,
USA*

Tom Williams, *Tufts University, USA*

Sam Spaulding, *MIT Media Lab, USA*

Chris Crawford, *University of Florida, USA*

Maria Vanessa aus der Wieschen,
University of Southern Denmark, Denmark

Hee Rin Lee, *Indiana University, USA*

Jung Ju Choi, *Ewha Womans University,
South Korea*

Igor Zubrycki, *Politechnika Lodzka, Poland*

Abstract The eleventh annual Human-Robot Interaction Pioneers Workshop will be held in Christchurch, New Zealand on Monday, March 7, 2016 in conjunction with the 2016 ACM/IEEE International Conference on Human-Robot Interaction.

Pioneers seeks to foster creativity and collaboration surrounding key challenges in human-robot interaction and empower students early in their academic careers. Each year, the workshop brings together a cohort of the world's top student researchers and provides the opportunity for students to present and discuss their work with distinguished student peers and senior scholars in the field.

Pioneers is a premiere forum for graduate students in HRI, thus we invite students at any stage of their academic career to consider applying. To facilitate attendance, we expect to provide financial support to accepted students to help mitigate the costs of the workshop and main conference.

Website <http://www.hripioneers.info/hri16/>





TUESDAY BOOTH

Day 2 – Tuesday, March 8, 2016 Program

09:00 - 09:15	Chairs's Welcome
09:15 - 09:30	Organization List of Chairs, Committees
09:30 - 10:30	Keynote Speaker Prof. Mark Sagar <i>Making Simulated Faces Come Alive</i>
10:30 - 11:00	HRI Pioneers Poster Session I
10:30 - 11:00	Coffee Break
11:00 - 12:00	Session A Assistive HRI
12:00 - 1:00	Lunch
1:00 - 2:30	Session B Human-Robot Collaboration
2:30 - 3:00	Coffee Break
3:00 - 3:30	Late Breaking Report Session 1
3:30 - 4:30	Alt.HRI
4:30 - 5:30	Videos
6:45 - 9:00	Welcome Reception

TUESDAY 8th



KEYNOTE SPEAKER
Prof. Mark Sagar,
*University of Auckland,
New Zealand*

Making Simulated Faces Come Alive

Our behaviour emerges as the result of many systems interacting at different scales, from low level biology to high level social interaction. Is it possible to create naturalistic explanatory models which can integrate these factors? We describe the general approach and design of a framework to create autonomous expressive embodied models of behaviour based on affective and cognitive neuroscience theories, sharing similar goals with current research in developmental robotics and embodied cognition, but with emphasis on computer graphics and face to face interaction. We aim to create a “large functioning sketch” of several fundamental aspects of behaviour affecting the face to explore emergence from interaction of low level and high level systems in a top-down bottom up approach.

A key feature of the approach is (given

the constraints of the medium), to create as naturalistic models as possible in order to elicit and respond to the appropriate behaviours from the user, involving both sensing and synthesis of visual and auditory stimuli. The models are intended to be as autonomous as possible, so interactions are unscripted and co-created. In order to develop an overall generative model of behaviour that, where possible, remains grounded in biologically plausible models and thus has more explanatory power than statistical approaches, we are developing BL, a modular Lego-like neural network modeling language, sensing and visual simulation framework, to facilitate integration of a range of emerging and established models from diverse sources such as cognitive science, developmental psychology, computational neuroscience and physiology with high quality interactive computer graphics. As a result of combining many diverse models, the neurobehavioural architectures created inBL often form large, complex networks and simulations form complex dynamic systems justifying a visual computing approach in which systems and subsystems can be explored visually as the simulation proceeds. As the users behaviour as an interactive partner is a key factor in social learning, it is important to capture and visualize the effect of internal and external events on the networks.

We describe progress along this path with an example, “BabyX”, a psychobiological model of a virtual infant we are developing. While we are exploring drivers of facial behaviour, we also expect this foundational approach has the potential for more ‘human’ computer interfaces.

We also describe our work on a face simulator designed to provide a more realistic face, and an increased biological basis, to existing conversational agents. For HCI tasks (and also HRI), we are building on the same underlying

computational platform the “Auckland Face Simulator” to produce highly realistic avatars capable of real-time interaction. These faces are designed to be both used as stimuli for psychological research and also to provide a realistic interface for third party virtual agent and AI applications. BL allows internal variables of the avatar’s nervous system to be controlled at any level, e.g. from muscles to affective circuits.

A live demonstration of “BabyX” and the “Auckland Face Simulator” will be given during the Keynote presentation.

10:00 - 10:30 HRI Pioneers Poster Session I

Effects of Proactivity and Expressivity on Collaboration with Interactive Robotic Drawers

Brian Mok, *Stanford University*

Transparency, teleoperation, and children’s understanding of social robots

Jacqueline Kory, *Westlund, MIT Media Lab*
Cynthia Breazeal, *MIT Media Lab*

Increasing Psychological Well-being Through Human-Robot Interaction

Zachary Henkel, *Mississippi State University*
Cindy Bethel, *Mississippi State University*

Designing Playful HRI. Acceptability of Robots in Everyday Life through Play

Maria Luce Lupetti, *Politecnico di Torino*

Robot Assistance in Medication Management Tasks

Jason Wilson, *Tufts University*

Teaching Multiple Robots by a Human

Jorge David Figueroa Heredia,
The University of Tokyo

Jun Ota, *The University of Tokyo*

Promoting Collaboration with Social Robots

Sarah Strohkorb, *Yale University*
Brian Scassellati, *Yale University*

The Effect of Intervention on Trust in Human-Robot Interaction

Daniel Ullman, *Brown University*
Bertram Malle, *Brown University*

Optimal Gaze-Based Robot Selection in Multi-Human Multi-Robot Interaction

Lingkang Zhang, *Simon Fraser University*
Richard Vaughan, *Simon Fraser University*

Robots Against Infectious Diseases

Kory Kraft, *Oregon State University*

Minimizing User Cost for Shared Autonomy

Shervin Javdani, *Carnegie Mellon University*
J. Andrew Bagnell, *Carnegie Mellon University*,
Siddhartha Srinivasa, *Carnegie Mellon University*

Human Coordination Dynamics with Heterogeneous Robots in a Team

Tariq Iqbal, *University of Notre Dame*
Laurel D. Riek, *University of Notre Dame*

Embodied Queries for Robot Task Learning

Kalesha Bullard, *Georgia Institute of Technology*

11:00 - 12:00
SESSION A
Assistive HRI
Chair: Elisabeth Broadbent, University of Auckland

11:00 - 11:12 ☉
Enabling Building Service Robots to Guide Blind People: A Participatory Design Approach

Shiri Azenkot, *Cornell Tech*
Catherine Feng, *Univ. of Washington*
Maya Cakmak, *Univ. of Washington*

Building service robots—robots that perform various services in buildings—are becoming more common in large buildings such as hotels and stores. We aim to leverage such robots to serve as guides for blind people. In this paper, we sought to design specifications that detail how a building service robot could interact with and guide a blind person through a building in an effective and socially acceptable way. We conducted participatory design sessions with three designers and five non-designers. Two of the designers and all of the non-designers had a vision disability. Primary features of the design include allowing the user to (1) summon the robot after entering the building, (2) choose from three modes of assistance (Sighted Guide, Escort, and Information Kiosk) and (3) receive information about the building's layout from the robot. We conclude with a discussion of themes and a reflection about our design process that can benefit robot design for blind people in general.

11:12 - 11:24 ☉
Seeing is Comforting: Effects of Teleoperator Visibility in Robot-Mediated Health Care

Kory Kraft, *OSU*
Bill Smart, *OSU*

Teleoperated robots can be used to provide medical care to patients in infectious disease outbreaks, alleviating workers from being in dangerous infectious zones longer than absolutely needed. Nevertheless, patients' reactions to this technology have not been tested. We test three hypotheses related to patients' comfort and trust of the operator and robot in a simulated Ebola Treatment Unit. Our findings suggest patients trust the robot teleoperator more when they can see the teleoperator.

11:24 - 11:36
Emotional Robot to Examine Differences in Play Patterns and Affective Response of Children with and Without ASD

Laura Boccanfuso, *Yale Univ.*
Erin Barney, *Yale Univ.*
Claire Foster, *Yale Univ.*
Yeo Jin Ahn, *Yale Univ.*
Katarzyna Chawarska, *Yale Univ.*
Brian Scassellati, *Yale Univ.*
Frederick Shic, *Yale Child Center*

Robots are often employed to proactively engage children with Autism Spectrum Disorder (ASD) in well-defined physical or social activities to promote specific educational or therapeutic outcomes. However, much can also be learned by leveraging a robot's unique

ability to objectively deliver stimuli in a consistent, repeatable way and record child-robot interactions that may be indicative of developmental ability and autism severity in this population. In this study, we elicited affective responses with an emotionsimulating robot and recorded child-robot interactions and child-other interactions during robot emotion states. This research makes two key contributions. First, we analyzed child-robot interactions and affective responses to an emotion-simulating robot to explore differences between the responses of typically developing children and children with Autism Spectrum Disorder (ASD). Next, we characterized play and affective responsivity and its connection to severity of autism symptoms using the Autism Diagnostic Observation Schedule (ADOS) calibrated severity scores. This preliminary work delivers a novel and robust robot-enabled technique for (1) differentiating child-robot interactions of a group of very young children with ASD (n=12) from a group of typically developing children (n=15) and, (2) characterizing within-group differences in play and affective response that may be associated with symptoms of autism severity.

11:36 - 11:48 🌀

Lessons Learned from the Deployment of a Long-term Autonomous Robot as Companion in Physical Therapy for Older Adults with Dementia

Denise Hebesberger, *AAHB*

Christian Dondrup, *Univ. Lincoln*

Tobias Koertner, *AAHB*

Christoph Gisinger, *AAHB*

Jürgen Pripfl, *AAHB*

The eldercare sector is a promising deployment area for robotics where robots can support staff and help to bridge the predicted staff-shortage. A requirement analysis showed that one field of robot-deployment could be supporting physical therapy of older adults with advanced dementia. To explore this possibility, a long-term autonomous robot was deployed as a walking group assistant at a care site for the first time. The robot accompanied two weekly walking groups for a month, offering visual and acoustic stimulation. Therapists' experience, the robot's influence on the dynamic of the group and the therapists' estimation of the robot's utility were assessed by a mixed methods design consisting of observations, interviews and rating scales. Findings suggest that a robot has the potential to enhance motivation, group coherence and also mood within the walking group. Furthermore, older adults show curiosity and openness towards the robot. However, robustness and reliability of the system must be high, other-wise technical problems quickly turn the robot from a useful assistant into a source of additional workload and exhaustion for therapists.

11:48 - 12:00

Assistive Teleoperation of Robot Arms via Automatic Time-Optimal Mode Switching

Laura Herlant, *CMU*

Rachel Holladay, *CMU*

Siddhartha Srinivasa, *CMU*

Assistive robotic arms are increasingly enabling users with upper extremity disabilities to perform activities of daily living on their own. However, the increased capability and dexterity of the arms also makes them harder to control with simple, low-dimensional interfaces like joysticks and sip-and-

puff interfaces. A common technique to control a high-dimensional system like an arm with a low-dimensional input like a joystick is through switching between multiple control modes. However, our interviews with daily users of the Kinova JACO arm identified mode switching as a key problem, both in terms of time and cognitive load. We further confirmed objectively that mode switching consumes about 17.4.

1:00 - 2:24
SESSION B
**Human-Robot
Collaboration
Chair: Séverin
Lemaignan,
Plymouth
University**

1:00 - 1:12
**Using Human Knowledge
Awareness to Adapt
Collaborative Plan
Generation, Explanation
and Monitoring**

Grégoire Milliez, *LAAS/CNRS*
Raphaël Lallement, *LAAS/CNRS*
Michelangelo Fiore, *LAAS/CNRS*
Rachid Alami, *LAAS/CNRS*

One application of robotics is to assist humans in the achievement of tasks they face in both the workplace and domestic environments. In some situations, a task may require the robot and the human to act together in a collaborative way

in order to reach a common goal. To achieve a collaborative plan, each agent (human, robot) needs to be aware of the tasks she/he must carry out and how to perform them. This paper addresses the issue of enhancing a robotic system with a dynamic model of its collaborator's knowledge concerning tasks of a shared plan. Using this model, the robot is able to adapt its collaborative plan generation, its abilities to give explanations and to monitor the overall plan execution. We present the algorithm we have elaborated to take advantage of the tree representation of our Hierarchical Task Network (HTN) planner to enhance the robot with appropriate explanation and execution monitoring abilities. To evaluate how our adaptive system is perceived by users and how much it improves the quality of the Human-Robot interaction, the outcome of a comparative study is presented.

1:12 - 1:24
**Robot Nonverbal
Behavior Improves Task
Performance In Difficult
Collaborations**

Henny Admoni, *Yale Univ.*
Thomas Weng, *Microsoft Corp*
Brian Scassellati, *Yale Univ.*

Nonverbal behaviors increase task efficiency and improve collaboration between people and robots. In this paper, we introduce a model for generating nonverbal behavior and investigate whether the usefulness of nonverbal behaviors changes based on task difficulty. First, we detail a robot behavior model that accounts for top-down and bottom up features of the scene when deciding when and how to perform deictic references (looking or pointing). Then, we analyze how a robot's deictic nonverbal behavior affects people's performance on a

memorization task under differing difficulty levels. We manipulate difficulty in two ways: by adding steps to memorize, and by introducing an interruption. We find that when the task is easy, the robot's nonverbal behavior has little influence over recall and task completion. However, when the task is challenging—because the memorization load is high or because the task is interrupted—a robot's nonverbal behaviors mitigate the negative effects of these challenges, leading to higher recall accuracy and lower completion times. In short, nonverbal behavior may be even more valuable for difficult collaborations than for easy ones.

1:24 - 1:36

Learning from Demonstration Facilitates Human-Robot Collaborative Task Execution

Maria Koskinopoulou, *FRT*
Stylios Piperakis, *FRT*
Panos Trahanias, *FRT*

Learning from Demonstration (LfD) is addressed in this work in order to establish a novel framework for Human-Robot Collaborative (HRC) task execution. In this context, a robotic system is trained to perform various actions by observing a human demonstrator. We formulate a latent representation of observed behaviors and associate this representation with the corresponding one for target robotic behaviors. Effectively, a mapping of observed to performed actions is defined, that abstracts action variations and differences between the human and robotic manipulators, and facilitates execution of newly-observed actions. The learned action-behaviors are then employed to accomplish task execution in an HRC scenario.

Experimental results obtained regard the successful training of a robotic arm with various action behaviors and its subsequent deployment in HRC task accomplishment. The latter demonstrate the validity and efficacy of the proposed approach in human-robot collaborative setups.

1:36 - 1:48

Initiative in Robot Assistance during Collaborative Task Execution

Jimmy Baraglia, *Osaka Univ.*
Maya Cakmak, *Univ. of Washington*
Yukie Nagai, *Osaka Univ.*
Rajesh Rao, *Univ. of Washington*
Minoru Asada, *Osaka Univ.*

Initiative during joint human-robot task execution. We develop a system capable of autonomously tracking and performing table-top object manipulation tasks with humans and we implement three different initiative models to trigger robot actions. Human initiated help gives control of robot action timing to the user; robot-initiated reactive help triggers robot assistance when it detects that the user needs help; and robot-initiated proactive help makes the robot help whenever it can. We performed a user study (N=18) to compare these trigger mechanisms in terms of task performance, usage characteristics, and subjective preference. We found that people collaborate best with a proactive robot, yielding better team fluency and high subjective ratings. However, they prefer having control of when the robot should help, rather than working with a reactive robot that only helps when it is needed.

1:48 - 2:00

Formalizing Human-Robot Mutual Adaptation: A Bounded Memory Model

Stefanos Nikolaidis, *CMU*

Anton Kuznetsov, *CMU*

David Hsu, *National Univ. Singapore*

Siddhartha Srinivasa, *CMU*

Mutual adaptation is critical for effective team collaboration. This paper presents a formalism for human-robot mutual adaptation in collaborative tasks. We propose the bounded-memory adaptation model (BAM), which captures human adaptive behaviours based on a bounded memory assumption. We integrate BAM into a partially observable stochastic model, which enables robot adaptation to the human. When the human is adaptive, the robot will guide the human towards a new, optimal collaborative strategy unknown to the human in advance. When the human is not willing to change their strategy, the robot adapts to the human in order to retain human trust. Human subject experiments indicate that the proposed formalism can significantly improve the effectiveness of human-robot teams, while human subject ratings on the robot performance and trust are comparable to those achieved by cross training, a state-of-the-art human-robot team training practice.

2:00 - 2:12

Anticipatory Robot Control for Efficient Human-Robot Collaboration

Chien-Ming Huang, *Univ. Wisconsin*

Bilge Mutlu, *Univ. Wisconsin*

Efficient collaboration requires collaborators to monitor the behaviors of their partners, make inferences about their task intent, and plan their own actions accordingly. To work seamlessly and efficiently with their human counterparts, robots must similarly rely on predictions of their users' intent in planning their actions. In this paper, we present an anticipatory control method that enables robots to proactively perform task actions based on anticipated actions of their human partners. We implemented this method into a robot system that monitored its user's gaze, predicted his or her task intent based on observed gaze patterns, and performed anticipatory task actions according to its predictions. Results from a human-robot interaction experiment showed that anticipatory control enabled the robot to respond to user requests and complete the task faster—2.5 seconds on average and up to 3.4 seconds—compared to a robot using a reactive control method that did not anticipate user intent. Our findings highlight the promise of performing anticipatory actions for achieving efficient human-robot teamwork.

2:12 - 2:24

Exploring Shared Control in Automated Driving

Mishel Johns, *Stanford Univ.*

Brian Mok, *SU*

David Sirkin, *SU*

Nikhil Gowda, *SU*

David Miller, *SU*

Walter Talamonti, *Ford Motor Co.*

Wendy Ju, *SU*

Automated driving systems that share control with human drivers by using haptic feedback through the steering wheel have been shown to have advantages over fully automated systems and manual driving. Here, we

describe an experiment to elicit tacit expectations of behavior from such a system. A gaming steering wheel electronically coupled to the steering wheel in a full-car driving simulator allows two participants to share control of the vehicle. One participant was asked to use the gaming wheel to act as the automated driving agent while another participant acted as the car driver. The course provided different information and visuals to the driving agent and the driver to simulate possible automation failures and conflict situations between automation and the driver. The driving agent was also given prompts that specified a communicative goal at various points along the course. Both participants were interviewed before and after the drive, and vehicle data and drive video were collected. Our results suggest that drivers were able to interpret simple trajectory intentions, such as a lane change, conveyed by the driving agent. However, the driving agent was not able to effectively communicate more nuanced, higher level ideas such as availability, primarily due to the steering wheel being the control mechanism. Torque on the steering wheel without warning was seen most often as a failure of automation. Gentle and steady steering movements were viewed more favorably.

2:30 - 3:30

Late Breaking Report Session 1

Social Interaction Moderates Human-Robot Trust-Reliance Relationship and Improves Stress Coping

Monika Lohani, Charlene Stokes, Marissa McCoy, Christopher Bailey, Susan Rivers

Poster Location: B1

Discrimination of human-like robots from real human in a perception sensor network

Anh Vu Le, Hoang Minh Do, Sang-Seok Yun, JongSuk Choi

Poster Location: B2

Intent Communication in Navigation through the Use of Light and Screen Indicators

Moondeep Shrestha, Tomoya Onishi, Ayano Kobayashi, Erika Uno, Hayato Yanagawa, Yuta Yokoyama, Alexander Schmitz, Mitsuhiro Kamezaki, Shigeki Sugano

Poster Location: B3

Lingodroids: Investigating grounded color relations using a social robot for children

Scott Heath, Kristyn Hensby, Jonathon Taufatofua, Peter Worthy, Marie Boden, Jason Weigel, Nikodem Rybak, Janet Wiles

Poster Location: B4

How Would Store Managers Employ Social Robots?

Chao Shi, Satoru Satake, Takayuki Kanda, Hiroshi Ishiguro

Poster Location: B5

Heart vs Hard Drive: Children Learn More From a Human Tutor Than a Social Robot

James Kennedy, Paul Baxter, Emmanuel Senft, Tony Belpaeme

Poster Location: B6

Social Cardboard: Prototyping a social ethnoid in the wild

Janet Wiles

Poster Location: B7

Impact of Affective Appraisal on Collaborative Goal Management: My Robot Shares My Worries

Mahni Shayganfar, Charles Rich, Candace Sidner

Poster Location: B8

Adverb Palette: GUI-based Support for Human Interaction in Multi-Objective Path-Planning

Meher Shaikh, Michael Goodrich, Daqing Yi

Poster Location: B9

Haptic Communication Robot for Urgent Notification of Hearing-Impaired People

Michihiko Furuhashi, Tsuyoshi Nakamura, Masayoshi Kanoh, Koji Yamada

Poster Location: B10

Integrating animation artists into the animation design of social robots

Etienne Balit, Dominique Vaufreydaz, Patrick Reignier

Poster Location: B11

Influence of a Humanoid Robot in Human Decision-Making When Using Direct and Indirect Requests

Alexander Lopez, Christian Penaloza, Francisco Cuellar

Poster Location: B12

Effective Social Cues for Human-Robot Interaction in Physical Training

Cheonshu Park

Poster Location: B13

Social Robots in Educational Institutions- They came to stay: Introducing, Evaluating and Securing Social Robots in Daily Education

Franziska Kirstein, Rikke Voldsgaard-Risager

Poster Location: B14

Making Live Theatre with Multiple Robots as Actors: Bringing Robots to Rural Schools to Promote STEAM Education for Underserved Students

Myounghoon Jeon, Maryam FakhrHosseini, Jaclyn Barnes, Zackery Duford, Ruimin Zhang, Joseph Ryan, Eric Vasey

Poster Location: B15

New Design of a Manipulator Control Interface That Employs Voice and Multi-Touch Commands

Tetsushi Oka, Keisuke Matsushima

Poster Location: B16

Action Elements of Emotional Body Expressions for Flying Robots

Chie Hieida, Hiroaki Matsuda, Shunsuke Kudoh, Takashi Suehiro

Poster Location: B17

Help-Giving Robot Behaviors in Child-Robot Games: Exploring Semantic Free Utterances

Cristina Zaga, Roelof Anne Jelle de Vries, Sem Spenkelink, Khiet Truong, Vanessa Evers

Poster Location: B18

Evaluating peer vs teacher robot interaction conditions with children using NAO robot for teaching programming basics

Yerassyl Diyas, Dmitriy Brakk, Yernar Aimambetov, Anara Sandygulova

Poster Location: B19

Smart Topic Detection for Robot Conversation

Elise Russell, Richard Povinelli, Andrew Williams

Poster Location: B20

Maintaining Trust While Fixated to a Rehabilitative Robot

Rasmus Reinholt March Jargensen, Laura Marie Uhlund Jensen, Trine Straarup Winther, Didde Marie Hellestrup, Lars Christian Jensen

Poster Location: B21

Generating Iconic Gestures based on Graphic Data Analysis and Clustering

Yuki Kadono, Yutaka Takase, Yukiko Nakano

Poster Location: B22

A Multi-modal Perception based Architecture for a Non-intrusive Domestic Assistant Robot

Christophe Mollaret, Alhayat Ali Mekonnen, Julien Pinquier, Frederic Lerasse, Isabelle Ferrane

Poster Location: B23

Humanoid Robots as Tools, Agents, and Experiencers

Markus Appel, Silvana Weber, Stefan Krause, Martina Mara

Poster Location: B24

3:30 - 4:30

Alt.HRI Chair: James Young, University of Manitoba

3:30 - 3:42

The Ethical Risk of Attachment: How to Identify, Investigate and Predict Potential Ethical Risks in the Development of Social Companion Robots

Andreas Huber, TU Wien - ACIN

**Astrid Weiss, Vienna University of
Technology**

**Marjo Rauhala, Vienna University of
Technology**

In this paper we present the Triple-A Model intended as a framework for researchers and developers to incorporate ethics in the user-and robot-centered design of social companion robots. The purpose of the model is to help identifying potential ethical risks in the implementation of Human-Robot Interaction (HRI) scenarios. We base our model on three interaction levels, which companion robots can offer: Assistance, Adaptation, and Attachment (Triple-A). Every single interaction level has its specific potential ethical risks, which can be addressed during the robot development phase. However, we especially focus on the prominent ethical risks of long-term human-robot attachment and its implications on human-robot relationships. We discuss the practical use and the theoretical foundation of the Triple-A model which is well-grounded in the social role theory from sociology and the human cognitive-mnemonic structure from cognitive science.

3:42 - 3:54

Integrating Roboticist Values into a Value Sensitive Design Framework for Humanoid Robots

EunJeong Cheon, *Indiana University*

Norman Su, *Indiana University Bloomington*

A good body of work in HRI has investigated how to design humanoids to effectively serve users' needs. This user centered approach has proved fruitful, but there exists relatively little work examining the intent and values of the roboticists themselves. Furthermore, we know little of how the values of roboticists influence their own designs. Such knowledge could help designers better reflect on whether their designs effectively convey particular ethics to their users. In this study, we analyzed 27 interviews of pioneer humanoid roboticists, seeking to identify the values of such roboticists. Our results suggest that roboticists' values are shaped by a dominant engineering-based background that emphasizes robotics as a field of integration (especially humanoids). Roboticists also see robots as testbeds for learning about humans themselves. We advocate a VSD approach for humanoids that goes beyond engineering disciplines and forces values to the forefront of discussion.

3:54 - 4:06

Lessons From Teachers on Performing HRI Studies with Young Children in Schools

Jacqueline KoryWestlund, *MIT Media Lab*

Goren Gordon, *Tel-Aviv University*

Samuel Spaulding, *MIT Media Lab*

Jin Joo Lee, *MIT Media Lab*

Luke Plummer, *MIT Media Lab*

Marayna Martinez, *MIT Media Lab*

Madhurima Das, *MIT Media Lab*

Cynthia Breazeal, *MIT Media Lab*

We deployed an autonomous social robotic learning companion in three preschool classrooms at an American public school for two months. Before and after this deployment, we asked the teachers and teaching assistants who worked in the classrooms about their views on the use of social robots in preschool education. We found that teachers' expectations about the experience of having a robot in their classrooms often did not match up with their actual experience. These teachers generally expected the robot to be disruptive, but found that it was not, and furthermore, had numerous positive ideas about the robot's potential as a new educational tool for their classrooms. Based on these interviews, we provide a summary of lessons we learned about running childrobot interaction studies in preschools. We share some advice for future researchers who may wish to engage teachers and schools in the course of their own human-robot interaction work. Understanding the teachers, the classroom environment, and the constraints involved is especially important for microgenetic and longitudinal studies, which require more of the school's time—as well as more of the researchers' time—and is a greater opportunity investment for everyone involved.

4:06 - 4:18

From Characterising Three Years of HRI to Methodology and Reporting Recommendations

Paul Baxter, *Plymouth University*

James Kennedy, *Plymouth University*

Emmanuel Senft, *Plymouth University*

Séverin Lemaignan, *Plymouth University*

Tony Belpaeme, *Plymouth University*

Human-Robot Interaction (HRI) research requires the integration and cooperation of multiple disciplines, technical and social, in order to make progress. In many cases using different motivations, each of these disciplines bring with them different assumptions and methodologies. We assess recent trends in the field of HRI by examining publications in the HRI conference over the past three years (over 100 full papers), and characterise them according to 14 categories. We focus primarily on aspects of methodology. From this, a series of practical recommendations based on rigorous guidelines from other research fields that have not yet become common practice in HRI are proposed. Furthermore, we explore the primary implications of the observed recent trends for the field more generally, in terms of both methodology and research directions. We propose that the interdisciplinary nature of HRI must be maintained, but that a common methodological approach provides a much needed frame of reference to facilitate rigorous future progress. 4:18-4:30 Investigating the Impact of Gender Segregation within Observational Pretend Play Interaction Anara Sandygulova, University College Dublin) This paper presents an observational study conducted at the public environment investigating children's engagement with a social robot within a pretend play scenario. A pretend

play system was designed in order to address the challenges of evaluating child-robot interaction by exploiting the advantages of ubiquitous robotics and ambient intelligence of multimodal, multi-sensory perception. The system performed successfully at a children's play centre where a humanoid NAO robot was able to dynamically adapt its gender by changing its gendered voice to match the gender of the child. By analyzing the free play of children, the results obtained confirm the hypothesis of gender segregation within child-robot interaction. These findings are important and ought to be considered when designing robotic applications for children in order to increase robot's perceived likeability, acceptance and engagement.

4:30 - 5:30

Videos Chair: Cindy Bethel, Mississippi State University

Smart Personal Mobility (SPM) for Service and Entertainment

Daesung Jeon, *Advanced Institutes of Convergence Technology, AICT*

Woo Taek, *Hanyang University ERICA Campus*

Hoimyoung, *Advanced Institutes of Convergence Technology, (AICT)*

NavCue: Context Immersive Navigation Assistance for Blind Travelers

Kangwei Chen, *Carnegie Mellon University*
Victoria Plaza-Leiva, *University of Malaga*
Byung-Cheol Min, *Purdue University*
Aaron Steinfeld, *Carnegie Mellon University*
M. Bernadine Dias, *Carnegie Mellon University*

Tega: A Social Robot

Jacqueline Kory Westlund, *MIT Media Lab*
Jin Joo Lee, *MIT Media Lab*
Luke Plummer, *MIT Media Lab*
Fardad Faridi, *MIT Media Lab*
Jesse Gray, *IF Robots*
Matt Berlin, *IF Robots*
Stacy Dyer, *Dyer Design*
Kristopher dos Santos, *MIT Media Lab*
Goren Gordon, *Tel-Aviv University Cynthia Breazeal*, *MIT Media Lab*

Building a Social Robot as a Game Companion in a Card Game

Filipa Correia, *INESC-ID*
Tiago Ribeiro, *INESC-ID*
Patricia Alves-Oliveira, *INESCID*,
Nuno Maia, *Instituto Superior Tecnico*
Francisco S. Melo, *INESC-ID*
Ana Paiva, *INESC-ID*

Augmented Reality Eyeglasses for Promoting Home-Based Rehabilitation for Children with Cerebral Palsy

Christopher Munroe, *University of Massachusetts-Lowell*
Yuanliang Meng, *University of Massachusetts-Lowell*
Holly Yanco, *University of Massachusetts-Lowell*
Momotaz Begum, *University of Massachusetts-Lowell*

Map Reading with an Empathic Robot Tutor

Lynne Hall, *University of Sunderland*
Colette Hume, *University of Sunderland*
Sarah Tazzyman, *University of Leicester*
Amol Deshmukh, *Heriot-Watt University Srinivasan*
Janarthanam, *Heriot-Watt University*
Helen Hastie, *Heriot-Watt University*
Ruth Aylett, *Heriot-Watt University*
Ginevra Castellano, *University of Birmingham*
Fotis Papadopoulos, *University of Birmingham*
Aidan Jones, *University of Birmingham*
Lee J. Corrigan, *University of Birmingham*
Ana Paiva, *INESC-ID*
Patricia Alves Oliveira, *INESC-ID*
Tiago Ribeiro, *INESC-ID*
Wolmet Barendregt, *University of Gothenburg*
Sofia Serholt, *University of Gothenburg*
Arvid Kappas, *Jacobs University Bremen*

Robot Maori Haka: Robots as cultural preservationists

Eduardo B. Sandoval, *University of
Canterbury*

Gi Min Ser, *University of Canterbury*

Omprakash Rudhru, *University of Canterbury*

Multisensory Robotic Therapy to Promote Natural Emotional Interaction for Children with ASD

Rachael Bevill, *George Washington
University*

Paul Azzi, *George Washington University*

Matthew Spadafora, *George Washington
University*

Chung Hyuk Park, *George*

Washington University

Hyung Jung Kim, *Centscure LLC*

JongWon Lee, *Michigan Technological
University*

Ayanna Howard, *Georgia Institute of
Technology*

Autonomous Human- Robot Proxemics: A Robot-Centered Approach

Ross Mead, *University of Southern California*

Maja Mataric, *University of Southern
California*

Social Robots for Automated Remote Instruction

Jamy Li, *Stanford University*

Wendy Ju, *Stanford University*

Tell Me More: Designing HRI to encourage more trust, disclosure, and companionship

Nikolas Martelaro, *Stanford University*

Victoria Nneji, *Duke University*

Wendy Ju, *Stanford University*

Pamela Hinds, *Stanford University*



WEDNESDAY
WITH
9

Day 3 – Wednesday, March 9, 2016 Program

09:00 - 10:00	Keynote Speaker Prof. Aude Billard <i>Towards Reproducing Humans' Exquisite Dexterity and Reactivity</i>
10:00 - 10:30	HRI Pioneers Poster Session 2
10:00 - 10:30	Coffee Break
10:30 - 11:18	Session C Morality and Trust in HRI
11:18 - 11:54	Session D Teleoperation in HRI
12:00 - 1:00	Lunch
1:00 - 2:00	Session E Companionship and Engagement with Robots
2:00 - 2:30	Coffee Break
2:30 - 3:00	Late Breaking Report Session 2
3:00 - 3:50	Session F Robots that Learn
4:00 - 5:00	Demos



KEYNOTE SPEAKER
Prof. Aude Billard,
EPFL, Switzerland

Towards Reproducing Humans' Exquisite Dexterity and Reactivity

Our homes, offices and urban surroundings are carefully built to be inhabited by us, humans. Tools and furniture are designed to be easily manipulated by the human hand. Floors and stairs are modeled for human-sized legs. For robots to work seamlessly in our environments they should have bodies that resemble in shape, size and strength to the human body, and use these with the same dexterity and reactivity.

This talk will provide an overview of techniques developed at LASA to enable robust, fast and flexible manipulation. Learning is guided by human demonstrations. Robust manipulation is achieved through sampling over distributions of feasible grasps.

Smooth exploration leverages on complete tactile sensing coverage and learned variable impedance models.

Bi-manual coordination offers ways to exploit the entire robot's workspace. Imprecise positioning and sensing is overcome using active compliant strategies, similar to that displayed by humans when facing situations with high uncertainty.

The talk will conclude with examples in which robots achieve super-human capabilities for catching fast moving objects with a dexterity that exceeds that of human beings.

10:00 - 10:30 **HRI Pioneers Poster Session II**

Enabling Long-term Human-Robot Interaction with adaptive behavior coordination

Markus Bajones, *TU Wien*

Learning and Grounding Haptic Affordances Using Demonstration and Human-Guided Exploration

Vivian Chu, *Georgia Institute of Technology*

Andrea Thomaz, *Georgia Institute of Technology*

Integrating Robot Values into a Design Framework for Humanoid Robots

EunJeong Cheon, *Indiana University*

Norman Su, *Indiana University*

Affective, Evaluative and Physiological Response to Robots in Three Novel Social Roles

Jamy Li, *Stanford University*

Evolutionary method for robot morphology: case study of social robot Probo

Albert De Beir, *Vrije Universiteit Brussel*
Bram Vanderborght, *Vrije Universiteit Brussel*

Ontological reasoning for human-robot teaming in search and rescue missions

Timea Bagosi, *Delft University of Technology*
Koen Hindriks, *Delft University of Technology*
Mark Neerinx, *Delft University of Technology*

Inferring Higher-Order Affordances for more Natural Human-Robot Collaboration

Vasanth Sarathy, *Tufts University*
Matthias Scheutz, *Tufts University*

Improving inclusion segmentation task performance through human-intent based humanrobot collaboration

Kirsten Kaplan, *Stanford University*
Allison M. Okamura, *Stanford University*

Boosting children's creativity through creative interactions with social robots

Patricia Alves-Oliveira, *INESC-ID*
Patricia Arriaga, *ISCTE-IUL*
Guy Hoffman, *Cornell University*
Ana Paiva, *INESC-ID*

Learning Complex Sequential Tasks from Demonstration: A Pizza Dough Rolling Case Study

Nadia Figueroa, *EPFL*
Lucia Pais, *EPFL*
Aude Billard, *EPFL*

Developing a Healthcare Robot with Personalized Behavior and Social Skills for the Elderly

Roxana Agrigoroaie, *ENSTA-ParisTech*
Adriana Tapus, *ENSTA-ParisTech*

Constructing Policies for Supportive Behaviors and Communicative Actions in Human-Robot Teaming

Elena Corina Grigore, *Yale University*
Brian Scassellati, *Yale University*

Symbiotic Child-Robot Interaction in Education

Daniel Davison, *Twente University*

Nonverbal Signaling for Non-Humanoid Robots During Human-Robot Collaboration

Elizabeth Cha, *University of Southern California*
Maja Mataric, *University of Southern California*

10:30 - 11:18

SESSION C

Morality and Trust in HRI Chair: Kerstin Fischer, University of Souther Denmark

10:30 - 10:42

Overtrust of Robots in Emergency Evacuation Scenarios

Paul Robinette, *Georgia Tech*
Wenchen Li, *Georgia Tech*
Robert Allen, *Georgia Tech*
Ayanna Howard, *Georgia Tech*
Alan Wagner, *Georgia Tech*

Robots have the potential to save lives in emergency scenarios, but could have an

equally disastrous effect if participants overtrust them. To explore this concept, we performed an experiment where a participant interacts with a robot in a non-emergency task to experience its behavior and then chooses whether to follow the robot's instructions in an emergency or not. Artificial smoke and fire alarms were used to add a sense of urgency. To our surprise, all 26 participants followed the robot in the emergency, despite half observing the same robot perform poorly in a navigation guidance task just minutes before. We performed additional exploratory studies investigating different failure modes. Even when the robot pointed to a dark room with no discernible exit the majority of people did not choose to safely exit the way they entered.

10:42 - 10:54

Trust Calibration within a Human-Robot Team: Comparing Automatically Generated Explanations

Ning Wang, *USC*

David Pynadath, *USC*

Trust is a critical factor for achieving the full potential of human-robot teams. Researchers have theorized that people will more accurately trust an autonomous system, such as a robot, if they have a more accurate understanding of its decision-making process.

Studies have shown that hand-crafted explanations can help maintain trust when the system is less than 100% reliable. In this work, we leverage existing agent algorithms to provide a domain-independent mechanism for robots to automatically generate such explanations. To measure the explanation mechanism's impact on trust, we collected self-reported survey data and behavioral data in an agent-based online testbed that simulates a human-robot

team task. The results demonstrate that the added explanation capability led to improvement in transparency, trust, and team performance.

Furthermore, by observing the different outcomes due to variations in the robot's explanation content, we gain valuable insight that can help lead to refinement of explanation algorithms to further improve human-robot trust calibration.

10:54 - 11:06

Can a Robot Bribe a Human? The Measurement of the Negative Side of Reciprocity in Human Robot Interaction

Eduardo B. Sandoval, *Univ. of Canterbury*

Jürgen Brandstetter, *Univ. of Canterbury*

Christoph Bartneck, *Univ. of Canterbury*

Reciprocity is a cornerstone of human relationships and apparently it also appears in human-robot interaction independently of the context. It is expected that reciprocity will play a principal role in HRI in the future. The negative side of reciprocal phenomena has not been entirely explored in human-robot interaction. For instance, a reciprocal act such as bribery between Humans and robots is a very novel area. In this paper, we try to evaluate the questions: Can a robot bribe a human? To what extent is a robot bribing a human affect his/her reciprocal response? We performed an experiment using the Rock, Paper, Scissors game (RPSG). The robot bribes the participant by losing intentionally in certain rounds to obtain his/her favour later, and through using direct and indirect speech in certain rounds. The participants could obtain between 20%-25% more money when the robot bribed them than in the control condition. The robot also used either

direct or indirect speech requesting a favour in a second task. Our results show that the bribing robot received significantly less reciprocation than in the control condition regardless of whether the request was couched in direct or indirect speech.

However there is a significant interaction effect between the bribe and speech conditions.

Moreover, just three of sixty participants reported the robot-bribe in an interview as a malfunction, though they did not mention any moral judgment about its behaviour.

Further, just 10% of the participants reported the bribe in the online questionnaire. We consider that our experiment makes an early contribution to continue the exploration of morally ambiguous and controversial reciprocal situations in HRI. Robot designers should consider the reciprocal human response towards robots in different contexts including bribery scenarios. Additionally our study could be used in guidelines for robot behavioural design to model future HRI interactions in terms of moral decisions.

11:06 - 11:18

Which Robot Am I Thinking About? The Impact of Action and Appearance on People's Evaluations of a Moral Robot

Bertram Malle, *Brown Univ.*

Matthias Scheutz, *Tufts Univ.*

Jodi Forlizzi, *CMU*

John Voiklis, *Brown Univ.*

In three studies we found further evidence for a previously discovered Human-Robot (HR) asymmetry in moral judgments: that people blame robots

more for inaction than action in a moral dilemma but blame humans more for action than inaction in the identical dilemma (where inaction allows four persons to die and action sacrifices one to save the four). Importantly, we found that people's representation of the "robot" making these moral decisions appears to be one of a mechanical robot. For when we manipulated the pictorial display of a verbally described robot, people showed the HR asymmetry only when making judgments about a mechanical-looking robot, not a humanoid robot.

This is the first demonstration that robot appearance affects people's moral judgments about robots.

11:18 - 11:54

SESSION D Teleoperation in HRI Chair: Jenay Beer, University of South Carolina

11:18 - 11:30

Teleoperated or Autonomous?: How to Produce a Robot Operator's Pseudo Presence in HRI

Kazuaki Tanaka, *Osaka Univ*

Naomi Yamashita, *NTT*

Hideyuki Nakanishi, *Osaka Univ.*

Hiroshi Ishiguro, *Osaka Univ.*

Previous research has made various efforts to produce human-like

presence of autonomous social robots. However, such efforts often require costly equipment and complicated mechanisms. In this paper, we propose a new method that makes a user feel as if an autonomous robot is controlled by a remote operator, with virtually no cost.

The basic idea is to manipulate people's knowledge about a robot by using priming technique.

Through a series of experiments, we discovered that subjects tended to deduce the presence/absence of a remote operator based on their prior experience with that same remote operator. When they interacted with an autonomous robot after interacting with a teleoperated robot (i.e., a remote operator) whose appearance was identical as the autonomous robot, they tended to feel that they were still talking with the remote operator. The physically embodied talking behavior reminded the subjects of the remote operator's presence that was felt at the prior experience. Their deductions of the presence/absence of a remote operator were actually based on their "beliefs" that they had been interacting with a remote operator. Even if they had interacted with an autonomous robot under the guise of a remote operator, they tended to believe that they were interacting with a remote operator even when they subsequently interacted with an autonomous robot.

11:30 - 11:42

Personality Perception of Robot Avatar Tele-operators

Paul Bremner, *UWE*
Oya Celiktutan, *QMU*
Hatice Gunes, *QMU*

Nowadays a significant part of human-human interaction takes place over distance.

Tele-operated robot avatars, in which an

operator's behaviours are portrayed by a robot proxy, have the potential to improve distance interaction, e.g., improving social presence and trust. However, having communication mediated by a robot changes the perception of the operator's appearance and behaviour, which have been shown to be used alongside vocal cues in judging personality. In this paper we present a study that investigates how robot mediation affects the way the personality of the operator is perceived.

More specifically, we aim to investigate if judges of personality can be consistent in assessing personality traits, can agree with one another, can agree with operators' self-assessed personality, and shift their perceptions to incorporate characteristics associated with the robot's appearance. Our experiments show that (i) judges utilise robot appearance cues along with operator vocal cues to make their judgments, (ii) operators' arm gestures reproduced on the robot aid personality judgments, and (iii) how personality cues are perceived and evaluated through speech, gesture and robot appearance is highly operator-dependent. We discuss the implications of these results for both tele-operated and autonomous robots that aim to portray personality.

11:42 - 11:54

Semi-Autonomous Telerobotic Assembly over High-Latency Networks

Jonathan Bohren, *Johns Hopkins Univ.*
Christopher Paxton, *Johns Hopkins Univ.*
Ryan Howarth, *Johns Hopkins Univ.*
Gregory Hager, *Johns Hopkins Univ.*
Louis Whitcomb, *Johns Hopkins Univ.*

We report the development and a preliminary multi-user evaluation of an assisted teleoperation architecture for assembly tasks over high-latency

networks. While such tasks still require human insight, there are often elements of these tasks which can be executed autonomously. Our architecture contextualizes a user's intended actions in a remote scene. It assists the user by performing the intended action more precisely based on the latest local scene model. We report the results of a multi-user study of nine participants to evaluate performance of this approach using a full-3D dynamic robotic simulation in a laboratory environment. The study required users to assemble part of a structure with 200 or 4000 milliseconds of time delay, with or without assistance from the reported system. For each condition, we evaluated performance based both on partial and final task completion times, and we estimated each user's workload with the NASA Task Load Index. The study showed that our architecture has the potential to increase feasibility of the task both with and without large telemetry delay and to enable users to complete elements of the task more rapidly. We also found that the assistance dramatically reduced the users' workload. We provide open-source implementations for all components of our system, which can be adapted to other robotic platforms.

1:00 - 2:00
SESSION E
**Companionship
and Engagement
with Robots**
**Chair: Fumihide
Tanaka,
University of
Tsukuba**

1:00 - 1:12 
**From Real-time Attention
Assessment to “With-me-
ness” in Human-Robot
Interaction**

Séverin Lemaignan, *EPFL*

Fernando Garcia, *EPFL*

Alexis Jacq, *EPFL*

Pierre Dillenbourg *EPFL*

Measuring “how much the human is in the interaction” - the level of engagement - is instrumental in building effective interactive robots. Engagement, however, is a complex, multi-faceted cognitive mechanism that is only indirectly observable. This article formalizes “with-me-ness” as one of such indirect measures. With-me-ness, a concept borrowed from the field of Computer-Supported Collaborative Learning, measures in a well-defined way to what extent the human is “with” the robot over the course of an interactive task. As such, it is a meaningful precursor of engagement. We expose in this paper the full methodology, from real-time estimation of the human's focus of attention (relying on a novel, open-source, vision-based head pose estimator), to on-line computation of

with-me-ness. We report as well on the experimental validation of this approach, using a naturalistic setup involving children during a complex robot-teaching task.

1:12 - 1:24

Machines as a Source of Consolation: Robot Responsiveness Increases Human Approach Behavior and Desire for Companionship

Gurit E. Birnbaum, IDC Herzliya

Moran Mizrahi, IDC Herzliya

Guy Hoffman, IDC Herzliya

Harry T. Reis, Univ. of Rochester

Eli J. Finkel, Northwestern Univ.

Omri Sass, IDC Herzliya

Responsiveness to one's bids for proximity in times of need is a linchpin of human interaction. Thus, the ability to be perceived as responsive has design implications for socially assistive robots. We report on a large-scale experimental laboratory study (n = 102) examining robot responsiveness and its effects on human attitudes and behaviors.

In one-on-one sessions, participants disclosed a personal event to a non-humanoid robot. The robot responded either responsively or unresponsively across two modalities:

Simple gestures and written text. We replicated previous findings that the robot's responsiveness increased perceptions of its appealing traits. In addition, we found that robot responsiveness increased nonverbal approach behaviors (physical proximity, leaning toward the robot, eye contact, smiling) and participants' willingness to be accompanied by the robot

during stressful events. These findings suggest that humans not only utilize responsiveness cues to ascribe social intentions to personal robots, but actually change their behavior towards responsive robots and may want to use such robots as a source of consolation.

1:24 - 1:36

Human Creativity Can be Facilitated Through Interacting With a Social Robot

Peter Kahn, Univ. of Washington

Takayuki Kanda, Osaka Univ.

Hiroshi Ishiguro ATR

Brian Gill, Seattle Pacific Univ.

Solace Shen, Univ. of Washington

Jolina Ruckert, Univ. of Washington

Heather Gary, Univ. of Washington

Is it possible to design robots of the future so that they can enhance people's creative endeavors? Forty-eight young adults were asked to produce their most creative ideas in a small Zen rock garden in a laboratory setting. Participants were randomly assigned to one of two conditions. In one condition, the robot Robovie (through a Wizard of Oz interface) encouraged participants to generate creative ideas (e.g., "Can you think of another way to do that?"), and pulled relevant images and video clip from the web for each participant to look at which could help spur the participant into more creative expressions. In a second condition, participants engaged in the same Zen rock garden task with the same core information, but through the modality of a self-paced PowerPoint presentation. Results showed that participants engaged in the creativity task longer and provided almost twice the number of creative expressions in the robot condition compared to the PowerPoint condition. Discussion

focuses on a vision of social robotics coupled with advances in natural language processing to enhance the human creative mind and spirit.

1:36 - 1:48

Tell Me More: Designing HRI to Encourage More Trust, Disclosure, and Companionship

Nikolas Martelaro, *Stanford Univ.*

Victoria Nneji, *Duke Univ.*

Wendy Ju, *Stanford Univ.*

Pamela Hinds, *Stanford Univ.*

Previous HRI research has established that trust, disclosure, and a sense of companionship lead to positive outcomes. In this study, we extend existing work by exploring behavioral approaches to increasing these three aspects of HRI. We increased the expressivity and vulnerability of a robot and measured the effects on trust, disclosure, and companionship during human-robot interaction. We engaged (N = 61) high school aged students in a 2 (vulnerability of robot: high vs. low) x 2 (expressivity of robot: high vs. low) between-subjects study where participants engaged in a short electronics learning activity with a robotic tutor. Our results show that students had more trust and feelings of companionship with a vulnerable robot, and reported disclosing more with an expressive robot. Additionally, we found that trust mediated the relationship between vulnerability and companionship. These findings suggest that vulnerability and expressivity may improve peoples' relationships with robots, but that they each have different effects.

1:48 - 2:00

Psychological Importance of Human Agency: How self-assembly affects user experience of robots

Yuan Sun, *Remix*

S. Shyam *Sundar, Penn State*

Does assembling one's robot enhance the quality of our interaction with it? And, does it matter whether the robot is a utilitarian tool or a socially interactive entity? We examined these questions with a 2 (Assembler: Self vs. Others) x 2 (Expectation Setting/Framing: Task-oriented robot vs. Interaction-oriented robot) between-subjects experiment (N = 80), in which participants interacted with a humanoid desktop robot (KT-Gadiator 19).

Results showed that participants tended to have more positive evaluations of both the robot and the interaction process when they set it up themselves, an effect that is positively mediated by a sense of ownership and a sense of accomplishment, and negatively mediated by perceived process costs of setting up the robot. They also tended to evaluate the robot and the interaction more positively when they expected it to be task oriented rather than interaction-oriented. Implications for theory and design of robots are discussed.

2:30 - 3:00

Late Breaking Report Session 2

User Feedback on Physical Marker Interfaces for Protecting Visual Privacy from Mobile Robots

Matthew Rueben, Frank Bernieri, Cindy Grimm, William Smart

Poster Location: B1

Who Should Robots Adapt to within Multi-Party Interaction of a Public Space?

Saida Mussakhojayeva, Madi Zhanbyrtayev, Yerlik Agzhanov, Anara Sandygulova

Poster Location: B2

Safe Human-Robot Cooperation with high payload robots in industrial applications

Christian Vogel, Markus Fritzsche

Poster Location: B3

Priming anthropomorphism Can the credibility of humanlike robots be transferred to non-humanlike robots?

Debora Zanatto, Massimiliano Patacchiola, Jeremy Goslin, Angelo Cangelosi

Poster Location: B4

Robot Assisted Music Therapy: A Case Study with Children Diagnosed with Autism

Jenay Beer, Michelle Boren, Karina Liles

Poster Location: B5

Human-Robot Partnership: A Study on Collaborative Storytelling

Clarice Wong, Tay Yong Ling Tay, Ruohan Wang, Yan Wu

Poster Location: B6

Human Expectations of Social Robots

Minae Kwon, Malte Jung, Ross Knepper

Poster Location: B7

Studying the Opposing Effects of Robot Presence on Human Corruption

Michal Roizman, Guy Hoffman, Shahar Ayal, Guy Hochman, Michal Reifen, Yossi Maaravi

Poster Location: B8

Employing User-Generated Content to Enhance Human-Robot Interaction in a Human-Robot Trust Game

Yuhua (Jake) Liang, Seungcheol Austin Lee

Poster Location: B9

NAMIDA: How to Reduce the Cognitive Workload of Driver

Nihan Karatas, Soshi Yoshikawa, Ravindra De Silva, Michio Okada

Poster Location: B10

Child's Culture-related Experiences with a Social Robot at Diabetes Camps

Anouk Neerincx, Rianne Kaptein, Elettra Oleari, Francesca Sacchitelli, Sylvia Van der Pal, Mark Neerincx

Poster Location: B11

Children's Perceptions of and Interactions with a Telepresence Robot

Kyoung Wan Cathy Shin, Jeonghye Han

Poster Location: B12

Emobie: A robot companion for children with anxiety

Lindsey Arnold

Poster Location: B13

Vocal Interaction with a 7-DOF Robotic Arm for Object Detection, Learning and Grasping

Stefano Rosa, Giorgio Toscana

Poster Location: B14

Expectations towards two robots with different interactive abilities

Kerstin Sophie Haring, David Silvera-Tawil, Mari Velonaki, Katsumi Watanabe

Poster Location: B15

Results of a Real World Trial with a Mobile Social Service Robot for Older Adults

Juergen Pripfl, Tobias Jasper Koertner, Daliah Batko-Klein, Denise Hebesberger, Markus Weninger, Christoph Gisinger, Susanne Frennert, Haykan Eftring, Margherita Antona, Iliia Adami, Astrid Weiss, Markus Bajones

Poster Location: B16

Applying Adaptive Social Mobile Agent to Facilitate Learning

Muneeb Ahmad, Omar Mubin

Poster Location: B17

Analysis of Lip-Sync Factor Affecting Communication of Android Robot

Hyun-Jun Hyung, Byeong-Kyu Ahn, Brian David Cruz, Dong-Wook Lee

Poster Location: B18

Robotic Assistance in Indoor Navigation for People who are Blind

Aditi Kulkarni, Allan Wang, M. Bernardine Dias, Aaron Steinfeld

Poster Location: B19

Discovering Patterns of Touch

Kris Rogers, Janet Wiles

Poster Location: B20

Study on Transition of Elderly People's Reactions in Robot Therapy

Toshimitsu Hamada, Yoshihito Kagawa, Hisashi Onari, Mitsuru Naganuma, Tomomi Hashimoto, Toshihiko Yoneoka

Poster Location: B21

A Novel Concept of Human-Robot Competition for HRI Reasoning: Where Does It Point?

Amit Kumar PANDEY, Lavindra de Silva, Rachid Alami

Poster Location: B22

Identifying Reusable Primitives in Narrated Demonstrations

Anahita Mohseni-Kabir, Sonia Chernova, Charles Rich

Poster Location: B23

3:00 - 3:48

SESSION

F Robots

that Learn

Chair: William

Smart, Oregon

State University

3:00 - 3:12 

Discovering Social Interaction Strategies for Robots from Restricted-Perception Wizard-of-Oz Studies

Pedro Sequeira, INESC-ID

Patrícia Alves-Oliveira, INESC-ID

Eugenio Di Tullio, INESC-ID

Tiago Ribeiro, INESC-ID

Sofia Petisca, INESC-ID

Francisco S. Melo, INESC-ID

Ana Paiva, INESC-ID

In this paper we propose a methodology for the creation of social interaction

strategies for human-robot interaction based on restricted-perception Wizard-of-Oz studies (WoZ). This novel experimental technique involves restricting the wizard's perceptions over the environment and the behaviors it controls according to the robot's inherent perceptual and acting limitations. Within our methodology, the robot's design life-cycle is divided into three consecutive phases, namely data collection, where we perform interaction studies to extract expert knowledge and interaction data; strategy extraction, where a hybrid strategy controller for the robot is learned based on the gathered data; strategy refinement, where the controller is iteratively evaluated and adjusted. We developed a fully-autonomous robotic tutor based on the proposed approach in the context of a collaborative learning scenario. The results of the evaluation study show that, by performing restricted-perception WoZ studies, our robots are able to engage in very natural and socially-aware interactions.

3:12 - 3:24

Incrementally Assisted Kinesthetic Teaching for Programming by Demonstration

Martin Tykal, *Aalto Univ.*

Alberto Montebelli, *Univ. of Skovde*

Ville Kyrki, *Aalto Univ.*

Kinesthetic teaching is an established method of teaching robots new skills without requiring robotics or programming knowledge. However, the inertia and uncoordinated motions of individual joints decrease the intuitiveness and naturalness of interaction and impair the quality of the learned skill. This paper proposes a method to ease kinesthetic teaching by combining the idea of incremental learning through warping several

demonstrations into a common frame with virtual tool dynamics to assist the user during teaching. In fact, during a sequence of demonstrations the stiffness of the robot under Cartesian impedance control is gradually increased, to provide stronger assistance to the user based on the demonstrations accumulated up to that moment.

Therefore, the operator has the opportunity to progressively refine the task's model while the robot more docilely follows the learned action. Robot experiments and a userstudy performed on 25 novice users show that the proposed approach improves both usability as well as resulting skill quality.

3:24 - 3:36

A Comparison of Types of Robot Control for Programming by Demonstration

Kerstin Fischer, *Univ. Southern Denmark*

Franziska Kirstein, *Blue Ocean Robotics*

Lars Jensen, *Univ. Southern Denmark*

Norbert Krüger, *USD*


Kamil Kukliński, *Bialystok Univ. of Tech.*

Maria Vanessa aus der Wieschen, *USD*

Thiusius Rajeeth, *Savarimuthu, USD*

Programming by Demonstration (PbD) is an efficient way for non-experts to teach new skills to a robot. PbD can be carried out in different ways, for instance, by kinesthetic guidance, teleoperation or by using external controls. In this paper, we compare these three ways of controlling a robot in terms of efficiency, effectiveness (success and error rate) and usability. In an industrial assembly scenario, 51 participants carried out peg-in-hole tasks using one of the three control modalities. The results show that

kinesthetic guidance produces the best results. In order to test whether the problems during teleoperation are due to the fact that users cannot, like in kinesthetic guidance, switch between control points using traditional teleoperation devices, we designed a new device that allows users to switch between controls for large and small movements. A user study with 15 participants shows that the novel teleoperation device yields almost as good results as kinesthetic guidance.

3:36 - 3:48 

Learning Object Affordances by Leveraging the Combination of Human-Guidance and Self-Exploration

Vivian Chu, *Georgia Tech*
Andrea Thomaz, *Georgia Tech*

Our work focuses on robots to be deployed in human environments. These robots, which will need specialized object manipulation skills, should leverage end-users to efficiently learn the affordances of objects in their environment. This approach is promising because people naturally focus on showing salient aspects of the objects. We replicate prior results and build on them to create a combination of self and supervised learning. We present experimental results with a robot learning 5 affordances on 4 objects using 1219 interactions. We compare three conditions: (1) learning through self-exploration, (2) learning from supervised examples provided by 10 naive users, and (3) self-exploration biased by the user input. Our results characterize the benefits of self and supervised affordance learning and

show that a combined approach is the most efficient and successful.

4:00 - 5:00 **Demos**

Educational Robots as Promoters of Cultural Development

Cuellar Francisco, *Pontificia Universidad Católica del Perú*

Penaloza Christian, *ATR*

Robot Maori Haka - The use of robots as cultural preservationists

Eduardo B. Sandoval, *University of Canterbury*

Qi Min Ser, *University of Canterbury*

Rudhru Omprakash, *University of Canterbury*

PaperBot: The Intelligent Paper Toy

Sonya S. Kwak, *Ewha Womans University*

Hyemee Kang, *Ewha Womans University*

Hyewon Lee, *Ewha Womans University*

Chenghuan Wu, *Ewha Womans University*

Compliant and Compact Joint Mechanism for a Child Android Robot

Ishihara Hisashi, *Osaka University*

Demonstration of OPSORO - an Open Platform for Social Robots

Cesar Vandevelde, *Ghent University*

Jelle Saldien, *Ghent University*



THURSDAY
10TH

Day 4 – Thursday, March 10, 2016 Program

09:00-10:00	Keynote Speaker Prof. Robert Sparrow <i>Kicking a Robot Dog</i>
10:00-10:30	Coffee Break
10:30-11:18	Session G Learning with Robots
11:18-11:54	Session H Movement in HRI
12:00-1:00	Lunch
1:00-2:00	Session I Tools and Techniques for Social Robots
2:00-3:00	Session J Attitudes and Responses to Social Robots
3:00-3:30	Coffee Break
3:30-4:00	Late Breaking Report Session 3
4:00-4:30	Awards
4:30-5:00	Closing Comments



KEYNOTE SPEAKER
Prof. Robert Sparrow,
Monash University,
Australia

Kicking a Robot Dog

Our homes, offices and urban surroundings are carefully built to be inhabited by us, humans. Tools and furniture are designed to be easily manipulated by the human hand. Floors and stairs are modeled for human-sized legs. For robots to work seamlessly in our environments they should have bodies that resemble in shape, size and strength to the human body, and use these with the same dexterity and reactivity.

This talk will provide an overview of techniques developed at LASA to enable robust, fast and flexible manipulation. Learning is guided by human demonstrations. Robust manipulation is achieved through sampling over distributions of feasible grasps.

Smooth exploration leverages on complete tactile sensing coverage and learned variable impedance models. Bi-manual coordination offers ways to exploit the entire robot's workspace.

Imprecise positioning and sensing is overcome using active compliant strategies, similar to that displayed by humans when facing situations with high uncertainty.

The talk will conclude with examples in which robots achieve super-human capabilities for catching fast moving objects with a dexterity that exceeds that of human beings.

10:30 - 11:18 **SESSION** **G Learning** **with Robots** **Chair: Cindy** **Bethel,** **Mississippi State** **University**

10:30 - 10:42 **Social Robot Tutoring for** **Child Second Language** **Learning**

James Kennedy, *Plymouth Univ.*

Paul Baxter, *Plymouth Univ.*

Emmanuel Senft, *Plymouth Univ.*

Tony Belpaeme, *Plymouth Univ.*

An increasing amount of research is being conducted to determine how a robot tutor should behave socially in educational interactions with children. Both human-human and human-robot interaction literature predicts an increase in learning with increased social availability of a tutor, where

social availability has verbal and nonverbal components. Prior work has shown that greater availability in the nonverbal behaviour of a robot tutor has a positive impact on child learning. This paper presents a study with 67 children to explore how social aspects of a tutor robot's speech influences their perception of the robot and their language learning in an interaction. Children perceive the difference in social behaviour between 'low' and 'high' verbal availability conditions, and improve significantly between a pre- and a post-test in both conditions. A longer-term retention test taken the following week showed that the children had retained almost all of the information they had learnt. However, learning was not affected by which of the robot behaviours they had been exposed to. It is suggested that in this short-term interaction context, additional effort in developing social aspects of a robot's verbal behaviour may not return the desired positive impact on learning gains.

10:42 - 10:54

Building Successful Long Child-Robot Interactions in a Learning Context

Alexis Jacq, *EPFL*

Séverin Lemaignan, *EPFL*

Fernando Garcia, *EPFL*

Pierre Dillenbourg *EPFL*

Ana Paiva, *Instituto Superior Tecnico*

The CoWriter activity involves a child in a rich and complex interaction where he has to teach handwriting to a robot. The robot must convince the child it needs his help and it actually learns from his lessons. To keep the child engaged, the robot must learn at the right rate, not too fast otherwise the kid will have no opportunity for improving his skills and not too slow otherwise he may lose

trust in his ability to improve the robot's skills. We tested this approach in real pedagogic/therapeutic contexts with children in difficulty over repeated long sessions (40-60 min). Through 3 different case studies, we explored and refined experimental designs and algorithms in order for the robot to adapt to the troubles of each child and to promote their motivation and self confidence.

We report positive observations, suggesting commitment of children to help the robot, and their comprehension that they were good enough to be teachers, overcoming their initial low confidence with handwriting.

10:54 - 11:06 🌀

Shaping Productive Help-Seeking Behavior During Robot-Child Tutoring Interactions

Aditi Ramachandran, *Yale Univ.*

Alexandru Litoiu, *Yale Univ.*

Brian Scassellati, *Yale Univ.*

In intelligent tutoring systems, one fundamental problem that limits learning gains is the unproductive use of on-demand help features, namely overuse or aversion, resulting in students misusing the system rather than engaging in active learning. Social robots as tutoring agents have the potential to mitigate those behaviors by actively shaping productive help-seeking behaviors. We hypothesize that effectual help-seeking behavior is a critical contributor to learning gains in a robot-child tutoring interaction. We conduct a between-subjects study where children interacted with a social robot solving fractions problems over multiple sessions (29 children; 4 sessions per child) in one of two groups. Results showed that participants in our experimental group, who received adaptive shaping strategies from

the robot targeting suboptimal help requests, reduced their suboptimal behaviors over time significantly more than a control group, as well as improved their scores from pretest to post test significantly more than a control group.

11:06 - 11:18

Effects of Voice-Adaptation and Social Dialogue on Perceptions of a Robotic Learning Companion

Nichola Lubold, *ASU*

Erin Walker, *ASU*

Heather Pon-Barry, *Mount Holyoke College*

With a growing number of applications involving social human-robot interactions, there is an increasingly important role for socially responsive speech interfaces that can effectively engage the user. For example, learning companions provide both task-related feedback and motivational support for students with the goal of improving learning. As a learning companion's ability to be socially responsive increases, so do learning outcomes.

This paper presents a socially responsive speech interface for an embodied, robotic learning companion. We explore two methods of social responsiveness. The first method introduces social responses into the dialogue, while the second method augments these responses with voice-adaptation based on acoustic-prosodic entrainment.

We evaluate the effect of a social, voice-adaptive robotic learning companion on social variables such as social presence and rapport, and we compare this to a companion with only social dialogue and one with neither social dialogue nor voice-adaptions.

We contrast the effects against those of individual factors, such as gender.

We find (1) that social presence is significantly higher with a social voice-adaptive speech interface than with purely social dialogue, and (2) that females feel significantly more rapport and are significantly more persistent in interactions with a robotic learning companion than males.

11:18 - 11:54

SESSION H Movement in HRI Chair: Dylan Glas, ATR

11:18 - 11:30

Emotion Encoding in Human-Drone Interaction

Jessica Cauchard, *Stanford Univ.*

Kevin Zhai, *Stanford Univ.*

Marco Spadafora, *Politecnico di Milano*

James Landay, *Stanford Univ.*

Drones are becoming more popular and may soon be H9H8ubiquitous. As they enter our everyday environments, it becomes critical to ensure their usability through natural Human-Drone Interaction (HDI). Previous work in Human-Robot Interaction (HRI) shows that adding an emotional component is part of the key to success in robots' acceptability. We believe the adoption of personal drones would also benefit from adding an emotional component. This work defines a range of personality traits and emotional attributes that can be encoded in drones through their flight paths. We present a user study (N=20) and show how well three defined emotional states can be recognized. We draw conclusions

on interaction techniques with drones and feedback strategies that use the drone's flight path and speed.

11:30 - 11:42

Viewpoint-Based Legibility Optimization

Stefanos Nikolaidis, *CMU*

Anca Dragan, *Berkeley*

Siddhartha Srinivasa, *CMU*

Much robotics research has focused on intent-expressive (legible) motion. However, algorithms that can autonomously generate legible motion have implicitly made the strong assumption of an omniscient observer, with access to the robot's configuration as it changes across time. In reality, human observers have a particular viewpoint, which biases the way they perceive the motion. In this work, we free robots from this assumption and introduce the notion of an observer with a specific point of view into legibility optimization. In doing so, we account for two factors: (1) depth uncertainty induced by a particular viewpoint, and (2) occlusions along the motion, during which (part of) the robot is hidden behind some object. We propose viewpoint and occlusion models that enable autonomous generation of viewpoint-based legible motions, and show through large-scale user studies that the produced motions are significantly more legible compared to those generated assuming an omniscient observer.

11:42 - 11:54

Homotopy-Aware RRT* Toward Human-Robot Topological Path-Planning

Daqing Yi, *BYU*

Michael Goodrich, *BYU*

Kevin Seppi, *BYU*

An important problem in human-robot interaction is for a human to be able to tell the robot go to a particular location with instructions on how to get there or what to avoid on the way. This paper provides a solution to problems where the human wants the robot not only to optimize some objective but also to honor "soft" or "hard" topological constraints, i.e. "go quickly from A to B while avoiding C". The paper presents the HARRT* (homotopy-aware RRT*) algorithm, which is a computationally scalable algorithm that a robot can use to plan optimal paths subject to the information provided by the human. The paper provides a theoretic justification for the key property of the algorithm, proposes a heuristic for RRT*, and uses a set of simulation case studies of the resulting algorithm to make a case for why these properties are compatible with the requirements of human-robot interactive path-planning.

1:00 - 2:00

SESSION I

Tools and Techniques for Social Robots Chair:

Candace Sidner,
Worcester Polytechnic Institute

1:00 - 1:12

An Open Platform for the Design of Social Robot Embodiments for Face-to-Face Communication

Cesar Vandevelde, *Ghent Univ.*

Jelle Saldien, *create*

The role of the physical embodiment of a social robot is of key importance during the interaction with humans. If we want to study the interactions we need to be able to change the robot's embodiment to the nature of the experiment. Nowadays, researchers build one-off robots from scratch or choose to use a commercially available platform. This is justified by the time and budget constraints and the lack of design tools for social robots. In this work, we introduce an affordable open source platform to accelerate the design and production of novel social robot embodiments, with a focus on face-to-face communication. We describe an experiment where Industrial Design students created physical embodiments for 10 new social robots using our platform, detailing the design methodology followed during

the different steps of the process. The paper gives an overview of the platform modules used by each of the robots, the skinning techniques employed, as well as the perceived usability of the platform. In summary, we show that our platform (1) enables non-experts to design new social robot embodiments, (2) allows a wide variety of different robots to be built with the same building blocks, and (3) affords itself to being adapted and extended.

1:12 - 1:24

Design and Evaluation of a Rapid Programming System for Service Robots

Justin Huang, *Univ. of Washington*

Tessa Lau, *Savioke*

Maya Cakmak, *Univ. of Washington*

This paper introduces CustomPrograms, a rapid programming system for mobile service robots. With CustomPrograms, roboticists can quickly create new behaviors and try unexplored use cases for commercialization. In our system, the robot has a set of primitive capabilities, such as navigating to a location or interacting with users on a touch screen. Users can then compose these primitives with general-purpose programming language constructs like variables, loops, conditionals, and functions. The programming language is wrapped in a graphical interface. This allows inexperienced or novice programmers to benefit from the system as well. We describe the design and implementation of CustomPrograms on a Savioke Relay robot in detail. Based on interviews conducted with Savioke roboticists, designers, and business people, we learned of several potential new use cases for the robot. We characterize our system's ability to fulfill these use cases. Additionally, we conducted a user study of the interface with Savioke employees and outside programmers. We found that

experienced programmers could learn to use the interface and create 3 real-world programs during the 90 minute study. Inexperienced programmers were less likely to create complex programs correctly. We provide an analysis of the errors made during the study, and highlight the most common pieces of feedback we received. Two case studies show how the system was used internally at Savioke and at a major trade show.

1:24 - 1:36

Human-Robot Interaction Design Using Interaction Composer: - Eight Years of Lessons Learned

Dylan Glas, *ATR*

Takayuki Kanda, *ATR*

Hiroshi Ishiguro, *Osaka Univ.*

Interaction Composer, a visual programming environment designed to enable programmers and non-programmers to collaboratively design social human-robot interactions in the form of state-based flows, has been in use at our laboratory for eight years. The system architecture and the design principles behind the framework have been presented in other work, but in this paper we take a case-study approach, examining several actual examples of the use of this toolkit over an eight-year period. We examine the structure and content of interaction flows, identify common design patterns, and discuss elements of the framework which have proven valuable, features which did not solve their intended purposes, and ways that future systems might better address these issues. It is hoped that the insights gained from this study will contribute to the development of more effective and more usable tools and frameworks for interaction design.

1:36 - 1:48

Situated Open World Reference Resolution for Human-Robot Dialogue

Tom Williams, *Tufts Univ.*

Saurav Achary, *Tufts Univ.*

Stephanie Schreitter, *Austrian Research Instit. for AI*

Matthias Scheutz, *Tufts Univ.*

A robot participating in natural dialogue with a human interlocutor may need to discuss, reason about, or initiate actions concerning dialogue-referenced entities. To do so, the robot must first identify or create new representations for those entities, a capability known as reference resolution. We previously presented algorithms for resolving references occurring in definite noun phrases. In this paper we present GH-POWER : an algorithm for resolving references occurring in a wider array of linguistic forms, by making novel extensions to the Givenness Hierarchy, and evaluate GH-POWER on natural task-based human-human and human-robot dialogue.

1:48 - 2:00 ☯

An Implemented Theory of Mind to Improve Human-Robot Shared Plans Execution

Sandra Devin, *LAAS-CNRS*

Rachid Alami, *LAAS-CNRS*

When a robot has to execute a shared plan with a human, a number of unexpected situations and contingencies can happen due, essentially, to human initiative. For instance, a temporary absence or inattention of the human can entail a partial, and potentially not sufficient, knowledge about the current situation. To ensure a successful and fluent execution of the shared plan the robot might need to detect such

situations and be able to provide the information to its human partner about what he missed without being annoying or intrusive. To do so, we have developed a framework which allows a robot to estimate the other agents mental states not only about the environment but also about the state of goals, plans and actions and to take them into account when executing human-robot shared plans.

2:00 - 3:00 **SESSION J** **Attitudes and Responses to Social Robots** **Chair: Mark Neerincx, Delft University of Technology**

2:00 - 2:12 **Human-Robots Implicit Communication based on Dialogue between Robots using Automatic Generation of Funny Scenarios from Web**

Ryo Mashimo, *Konan Univ.*

Tomohiro Umetani, *KU*

Tatsuya Kitamura, *KU*

Akiyo Nadamoto, *KU*

Numerous studies have examined communication robots that communicate with people, but it is

difficult for robots to communicate with people smoothly. We call the communication style based on dialogue between robots as “human-robot implicit communication”. As described herein, we propose a Manzai-robots for which the interaction style is human-robot implicit communication based on an automatically generated scenario from web news. Our generated Manzai scenario consists of snappy patter and a misunderstanding of dialogue based on the four kinds of gap of structure of funny points. Our purpose is that people feel familiarity from smoothly human-robot communication using dialogue between robots based on a Manzai scenario. We conducted experiment of three kinds to assess (1) the effectiveness of automatic creation of Manzai scenario for the robots, (2) the effectiveness of the Manzai-robots as a media, and (3) the effectiveness of types of familiarity for Manzai-robots. Based on their results, we measured the familiarity and smooth communication of our Manzai-robots.

2:12- 2:24 **Do People Spontaneously Take a Robot’s Visual Perspective?**

Xuan Zhao, *Brown Univ.*

Corey Cusimano, *Brown Univ.*

Bertram F. Malle, *Brown Univ.*

Visual perspective taking plays a fundamental role in both human-human interaction and human-robot interaction (HRI). In three exWr what conditions, people spontaneously take a robot’s visual perspective. Using two different robot models, we found that specific behaviors performed by a robot—namely, object directed gaze and goal-directed reaching—led many human viewers to take the robot’s visual perspective, though slightly fewer than when the same behaviors

were performed by a person. However, we found no difference in people's perspective-taking tendency toward robots that differed in their human-likeness. Also, reaching became an especially effective perspective-taking trigger when it was displayed in a video rather than in a photograph. Taken together, these findings suggest that certain nonverbal behaviors in robots are sufficient to trigger the mechanism of mental state attribution—visual perspective taking in particular—in human observers. Therefore, people's spontaneous perspective-taking tendencies should be taken into account when designing intuitive and effective human-centered robots.

2:24 - 2:36

The Hollywood Robot Syndrome: Media Effects on Older Adults' Attitudes toward Robots and Adoption Intentions

S. Shyam *Sundar, Penn State*

T. Franklin *Waddell, Penn State*

Eun Hwa *Jung, Penn State*

Do portrayals of robots in popular films influence older adults' robot anxiety and adoption intentions? Informed by cultivation theory, disposition theory and the technology acceptance model, the current survey (N = 379) examined how past exposure to robots in the media affect older adults' (Mage = 66) anxiety towards robots and their subsequent perceptions of robot usefulness, ease of use, and adoption intentions. The results of a structural equation model (SEM) analysis indicate that the higher the number of media portrayals recalled, the lower the anxiety towards robots. Furthermore, recalling robots with a human-like appearance or robots that elicit greater feelings of sympathy was related to

more positive attitudes towards robots. Theoretical and practical implications of these results for the design of socially assistive robots for older adults are discussed.

2:36 - 2:48

Are We Ready for Sex Robots?

Matthias Scheutz, *Tufts Univ.*

Thomas Arnold, *Tufts Univ.*

Sex robots are gaining a remarkable amount of attention in current discussions about technology and the future of human relationships. To help understand what kinds of relationships people will have with these robots, empirical data about people's views of sex robots is a necessary contribution to these debates. We report the results of the first systematic survey that asks about the appropriateness and value of sex robots, acceptable forms they can take, and the degree to which using them counts as sex. The results show a consistent difference in the uses for which women and men found sex robots to be appropriate, with women less and men more inclined to consider them socially useful. We also found convergences on what sex robots are like and how sex with them is to be classified, suggesting that larger views about relationships and society, not just understandings of sex robots themselves, should be a matter for more research and thus frame future work on the ethics of sex robots.

2:48 - 3:00

Overcoming the Uncanny Valley: Displays of Emotions Reduce the Uncanniness of Humanlike Robots

Miriam Koschate, *Univ. of Exeter*

Richard Potter, *Univ. of Exeter*

Paul Bremner, *Univ. of Exeter*

Mark Levine, *Univ. of Exeter*

In this paper we show empirically that highly humanlike robots make thoughts of death more accessible, leading to perceptions of uncanniness and eeriness of such robots. Rather than reducing the humanlikeness of robots, our research suggests the addition of emotion displays to decrease a sense of uncanniness. We show that a highly humanlike robot displaying emotions in a social context reduces death-thought accessibility (DTA), which in turn reduces uncanniness. In a pre-test with N = 95 participants, we established that not all humanoid robots elicit thoughts of death and that the extent to which a robot appears humanlike may be linked to DTA. In our Main Study, N = 44 participants briefly interacted with a highly humanlike robotic head that either showed appropriate basic emotions or reacted by blinking. The display of emotions significantly reduced perceptions of uncanniness, which was mediated by a corresponding reduction in DTA. Implications for the design of humanoid robots are proposed.

3:00 - 4:00

Late Breaking Report Session 3

Assessing the Elderly's Communication Attitude based on Prosodic Information and Head Motions

Toshiki Yamanaka, **Yutaka Takase**,
Yukiko Nakano

Poster Location: B1

Interactive Robotic Framework for Multi-sensory Therapy for Children with Autism Spectrum Disorder

Hyung Jung Kim, **JongWon Lee**, **Ariana Rennie**, **Rachael Beville**, **Chung Hyuk Park**, **Myounghoon Jeon**, **Ayanna Howard**

Poster Location: B2

Effects of framing a robot as a social agent or as a machine on children's social behavior

Jacqueline Kory Westlund, **Marayna Martinez**, **Maryam Archie**, **Madhurima Das**, **Cynthia Breazeal**

Poster Location: B3

Modeling of Honest Signals for Human Robot Interaction

Muhammad Attamimi, **Yusuke Katakami**, **Kasumi Abe**, **Takayuki Nagai**, **Tomoaki Nakamura**

Poster Location: B4

Are You Messing with Me? Querying about the Sincerity of Interactions in the Open World

Sean Andrist, **Dan Bohus**, **Zhou Yu**, **Eric Horvitz**

Poster Location: B5

How Expressiveness of a Robotic Tutor is Perceived by Children in a Learning Environment

Amol Deshmukh, Helen Hastie, Srinivasan Janarthanam, Meiyi Lim, Ruth Aylett

Poster Location: B6

The birth of a new discipline: Robotology. A First Robotologist Study over a Robot Maori Haka.

Eduardo B. Sandoval, Qi Min Ser, Omprakash Rudhru

Poster Location: B7

Sensor Box - designing interactive tool for sensory therapy

Igor Zubrycki, Grzegorz Granosik

Poster Location: B8

Providing a Robot with Learning Abilities Improves its Perception by Users

Emmanuel Senft, Paul Baxter, James Kennedy, SÅ@verin Lemaignan, Tony Belpaeme

Poster Location: B9

What Untrained People Do When Asked Make The Robot Come To You

Shokoofeh Pourmehr, Jack Thomas, Richard Vaughan

Poster Location: B10

A Pilot Study about Remote Teaching by Elderly People to Children over a Two-way Telepresence Robot System

Erina Okamura, Fumihide Tanaka

Poster Location: B11

Hand in Hand: Tools and techniques for understanding children's touch with a social robot

Kristyn Hensby, Janet Wiles

Poster Location: B12

Soft Systems Methodology as a Tool to Aid a Pilot Study in Robot-Assisted Therapy

Lundy Lewis, Nancy Charron, Chris Clamp, Mike Craig

Poster Location: B13

Crowdsourced Coordination Through Online Games

Arash Tavakoli, Haig Nalbandian, Nora Ayanian

Poster Location: B14

Improving Robot Reactivity to Passers-by with a Faster People Detector

Alhayat Ali Mekonnen, Frederic Lerasle, Ariane Herbulot

Poster Location: B15

You Win,I Lose: Towards Adapting Robot's Teaching Strategy

Serik Meirbekov, Kairat Balkibekov, Zhandarbek Jalankuzov, Anara Sandygulova

Poster Location: B16

Japanese students apply same moral norms to humans and robot agents: Considering a moral HRI in terms of different cultural and academic backgrounds

Takanori Komatsu

Poster Location: B17

Analysis of Long-Term and Large-Scale Experiments on Robot Dialogues Using a Cloud Robotics Platform

Komei Sugiura, Koji Zetsu

Poster Location: B18

Improving Social Skills of Robot for Triggering Distant Informal Communication in the Office

Jianfeng Xu, Inge Becht, Shigeyuki Sakazawa

Poster Location: B19

A large scale tactile sensor for safe mobile robot manipulation

Markus Fritzsche, Jose Saenz, Felix Penzlin

Poster Location: B20

Socially Contingent Humanoid Robot Head Behaviour Results in Increased Charity Donations

Paul Wills, Paul Baxter, James Kennedy, Emmanuel Senft, Tony Belpaeme

Poster Location: B21

How Robot's Animacy Affects Human Tolerance for their Malfunctions?

Tomoko Koda, Yuta Nishimura, Tomofumi Nishijima

Poster Location: B22

Natural Interactions using Social Cues for Affordance Communication during Human-Robot Collaboration

Hugo Romat, Mary-Anne Williams, Xun Wang, Benjamin Johnston, Henry Bard

Poster Location: B23



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Important Dates

3 October 2016

*Submission of full papers, tutorial/
workshop proposals*

21 November 2016

Notification of full paper acceptance

5 December 2016

*Submission of late breaking reports,
demonstrations, and videos*

19 December 2016

Notification of late breaking reports & videos

12th ACM/IEEE International Conference on
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