2013

TOKYO/JAPAN

Welcome

Welcome to Tokyo! The *Eighth Annual ACM/IEEE International Conference on Human-Robot Interaction* (*HRI 2013*) is a highly selective conference that aims to showcase the very best interdisciplinary and multidisciplinary research in human-robot interaction with roots in robotics, social psychology, cognitive science, HCI, human factors, artificial intelligence, design, engineering, and many more. We invite broad participation and encourage discussion and sharing of ideas across a diverse audience.

Robotics is growing increasingly multidisciplinary as it moves towards realizing capable and collaborative robots that are studied in both laboratory and real world settings. Concurrent development of technical, social, and designed aspects of systems, with a concern for how they will improve the world, is needed. Therefore, this year's theme is dedicated to Robots as Holistic Systems, which highlights the importance of an interdisciplinary approach to all of HRI. *HRI 2013* focuses on a wide variety of robotic systems that operate, collaborate with, learn from, and meet the needs of human users in real-world environments.

Full Papers submitted to the conference were thoroughly reviewed and discussed. The process utilized a rebuttal process and a worldwide team of dedicated, interdisciplinary reviewers. This year's conference continues the tradition of selectivity with 26 out of 107 (24%) submissions accepted. Due to the joint sponsorship of ACM and IEEE, papers are archived in both the ACM Digital Library and IEEE Xplore. This year's conference has journal special sessions as a new category for the technical sessions. 7 papers accepted on Journal of Human-Robot Interaction appear on the conference to show their journal level works.

Accompanying the full papers are the Late Breaking Reports, Videos, and Demos. For the LBR, 95 out of 100 (95%) two-page papers were accepted and will be presented as posters at the conference. For the Videos, 16 of 22 (72%) short videos were accepted and will be presented during the video session. The Demos is new to our conference. We have 22 robot systems for all participants to be able to interact with the innovative systems.

Rounding out the program are two keynote speakers who will discuss topics relevant to HRI: Dr. Yuichiro Anzai and Dr. Tomotaka Takahashi. We also have a panel session on Revisioning HRI Given Exponential Technological Growth.

The conference could not have occurred without the extensive volunteer effort put forth by the organizing committee, program committee, and reviewers. We would also like to thank the keynote speakers, panelists for their participation and attendance. The sponsors of the conference are ACM SIGCHI, ACM SIGART, and IEEE Robotics and Automation. The conference is in cooperation with AAAI and HFES.

Finally, we are especially thankful for the hard work by authors who submitted papers, videos, and demos. HRI is a vibrant community, and there was a large volume of high quality submissions. This makes reviewing difficult, but ensures a high quality conference. We hope you will be inspired by this high quality content and enjoy your stay in Tokyo.

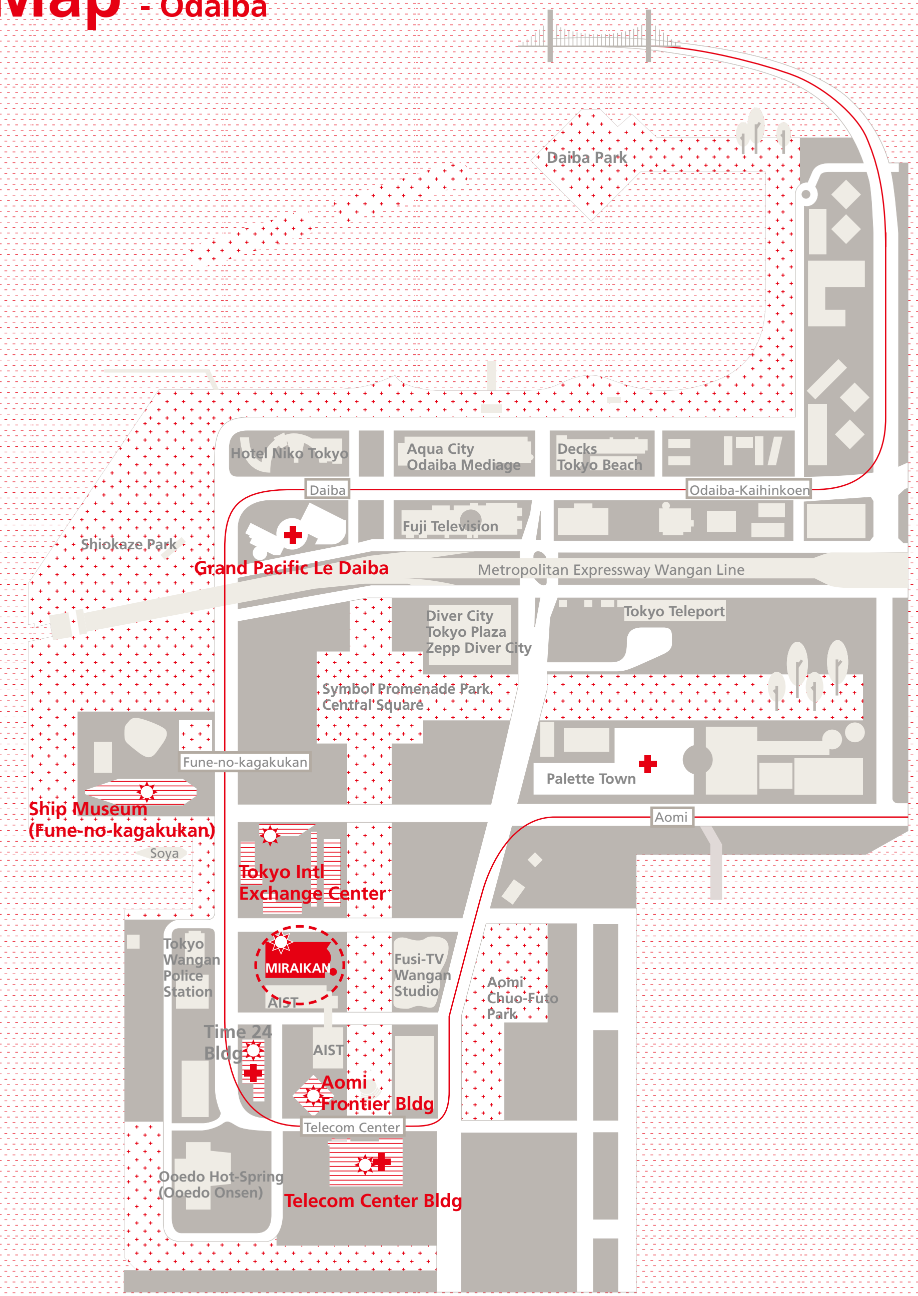
Hideaki Kuzuoka
HRI'13 General Co-Chair
University of Tsukuba, Japan

Vanessa Evers
HRI'13 General Co-Chair
University of Twente, Netherlands

Michita Imai
HRI'13 Program Co-Chair
Keio University, Japan

Jodi Forlizzi
HRI'13 Program Co-Chair
Carnegie Mellon University, USA

Map - Odaiba



Miraikan HRI 2013

Restaurant & Convenience Store

MIRAIKAN
Restaurant
Cafe
Fastfood Shop

Ship Museum(Funo-no-kagakukan)
Bayside Terrace “**Cabin**”
Seaside Restaurant “**Kaiou**”

Time 24 Bldg
Sky Restaurant “**Seagull**”
Cafe “**La mer**”
Sunkus

Aomi Frontier Bldg
Green’s Chef
am-pm

Telecom Center
Shinshu Soba Noodle “**Soji-boh**”
Italian Market “**Vario**”
Bar “**Roku Uemon**”
Telecom Center Artium “ **Espresso Americano**”
Cafeteria “**Ai House**”
China Restaurant “**Touen**”
Meatball & Bowl “**Shoya**”
Restaurant & Bar “**Precious Tokyo Bay**”
Lunchbox Food “**Yatai Deli**”

Tokyo Intl. Exchange Center
Daily Yamzaki

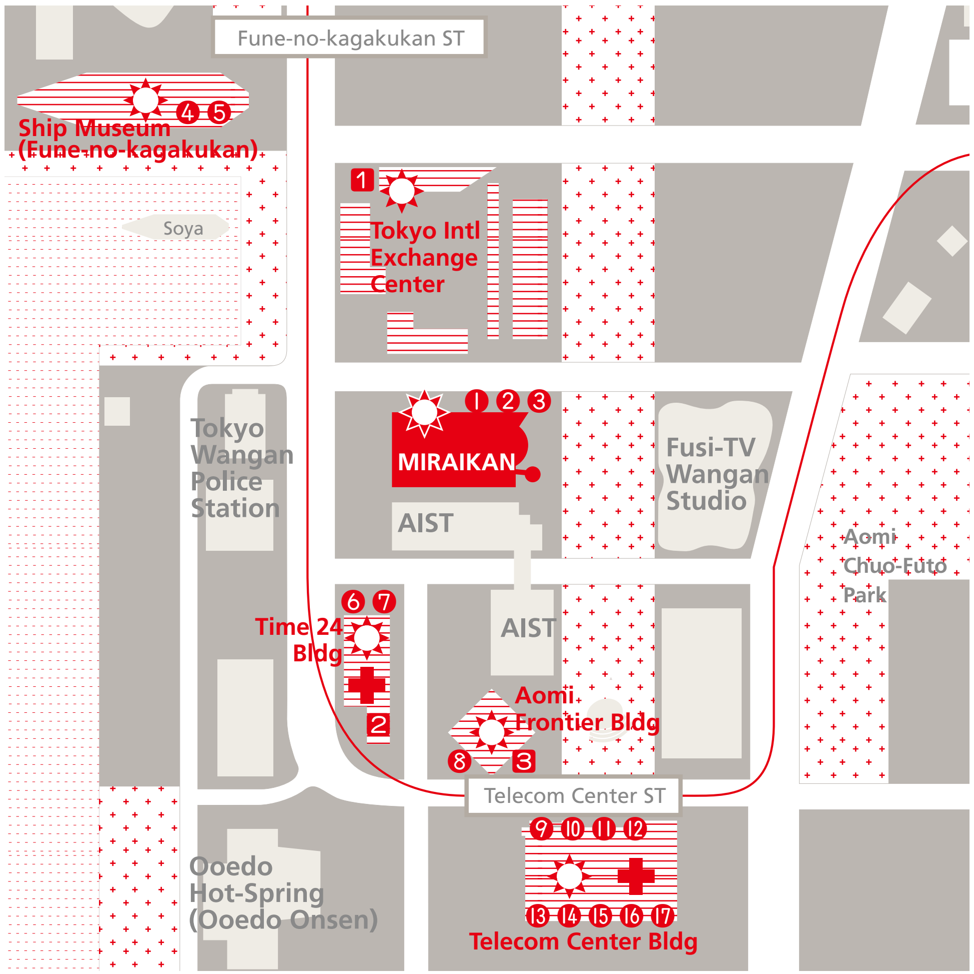
Clinic

Tokyo Seaside Clinic in Hotel Grand Pacific
www.ts-clinic.jp
03-5579-0355

Sunfield Clinic in Time 24 Building
www.sunfield-c.com
03-3599-3311

Telecom Center Dental Clinic in Telecom Center
03-5500-0418

Map - Restaurant & Convenience Store



Restaurant

MIRAIKAN
- ❶ Restaurant
- ❷ Cafe
- ❸ Fastfood Shop

Ship Museum(Funo-no-kagakukan)
- ❹ Bayside Terrace “**Cabin**”
- ❺ Seaside Restaurant “**Kaiou**”

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- ❻ Sky Restaurant “**Seagull**”
- ❼ Cafe “**La mer**”

Aomi Frontier Bldg
- ❽ Green’s Chef

Telecom Center
- ❾ Shinshu Soba Noodle “**Soji-boh**”
- ❿ Italian Market “**Vario**”
- ⓫ Bar “**Roku Uemon**”
- ⓬ Telecom Center Artium “ **Espresso Americano**”
- ⓭ Cafeteria “**Ai House**”
- ⓮ China Restaurant “**Touen**”
- ⓯ Meatball & Bowl “**Shoya**”
- ⓰ Restaurant & Bar “**Precious Tokyo Bay**”
- ⓱ Lunchbox Food “**Yatai Deli**”

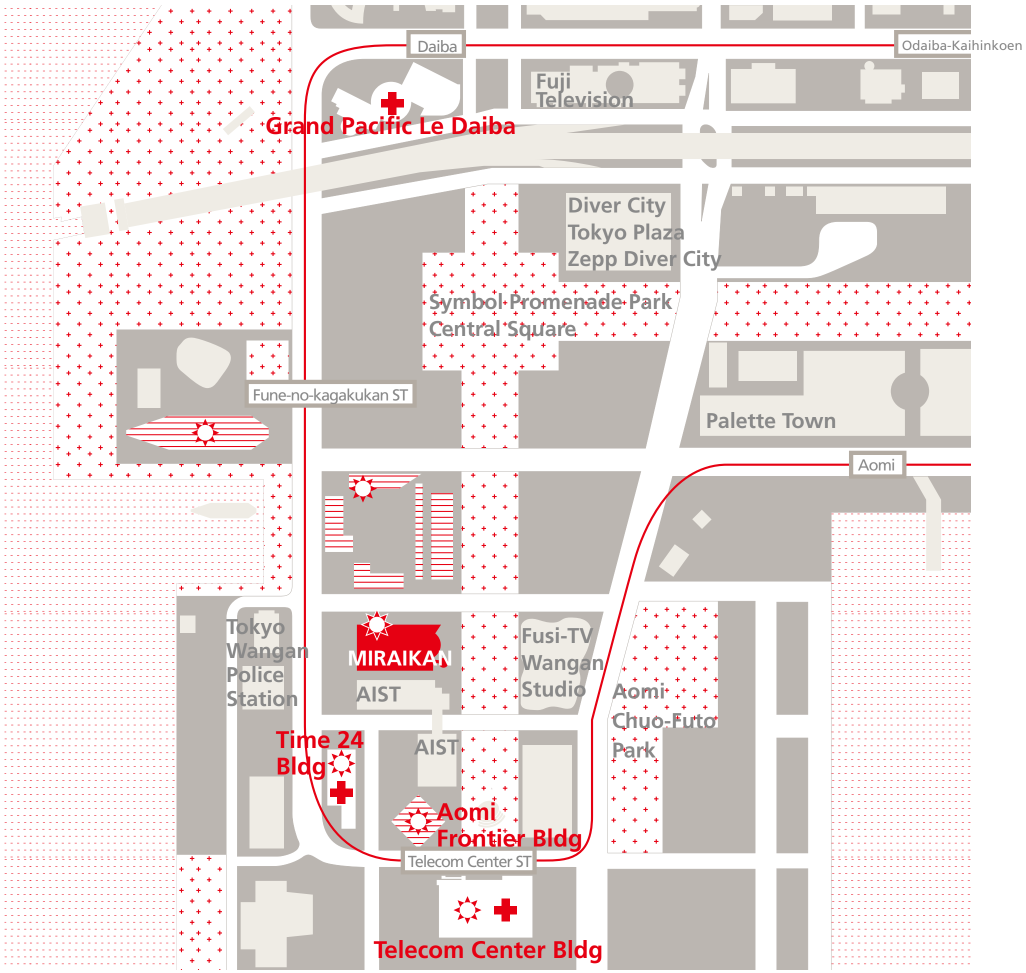
Convenience Store

Tokyo Intl. Exchange Center
- 1 Daily Yamzaki

Time 24 Bldg
- 2 Sunkus

Aomi Frontier Bldg
- 3 am-pm

Map - Clinic



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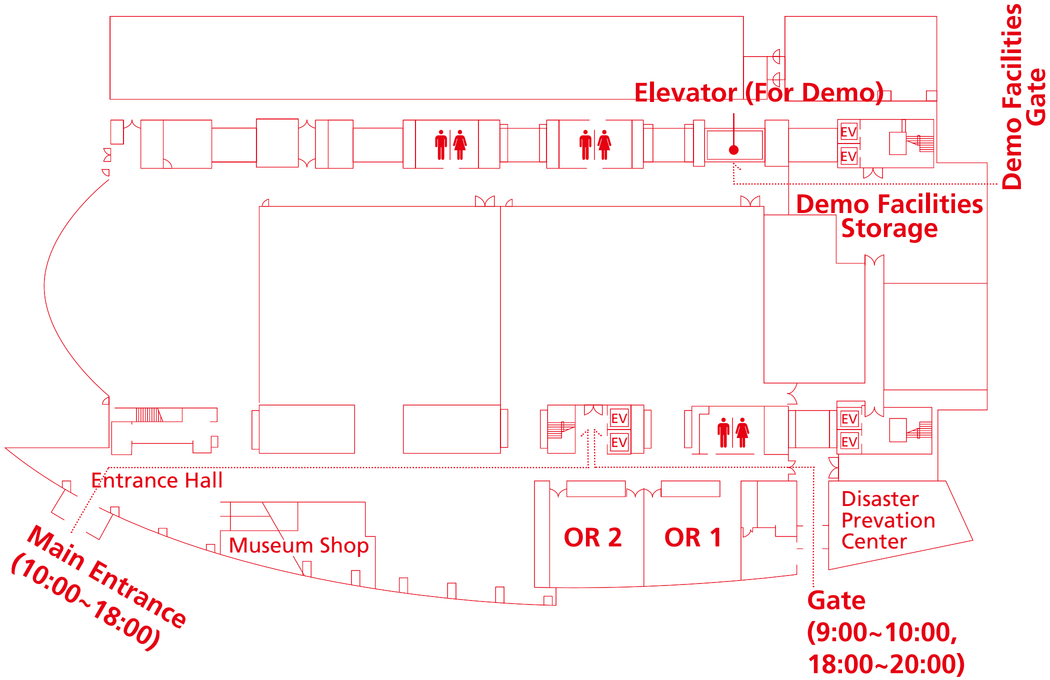
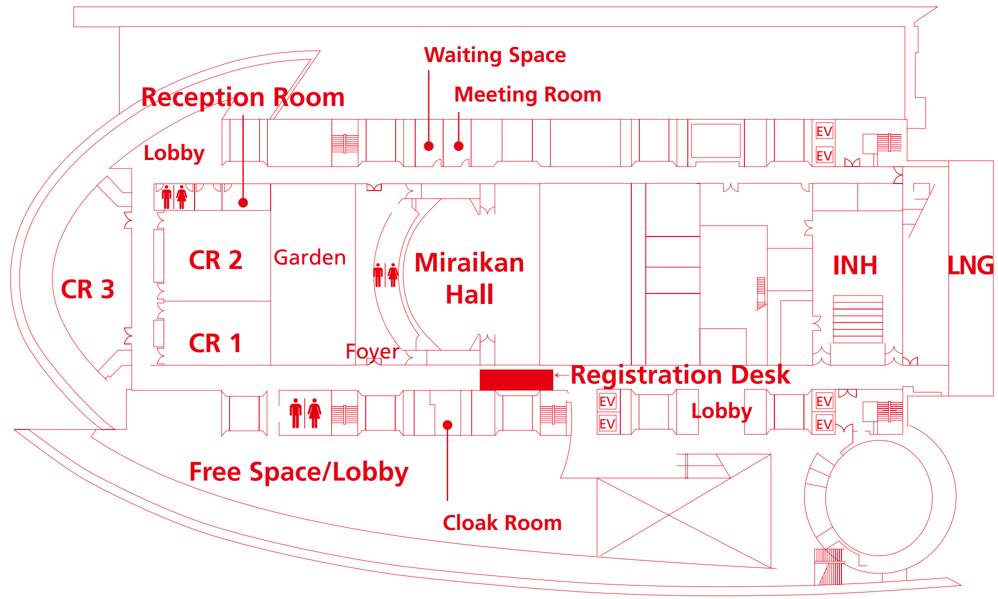
Map - HRI 2013 Miraikan

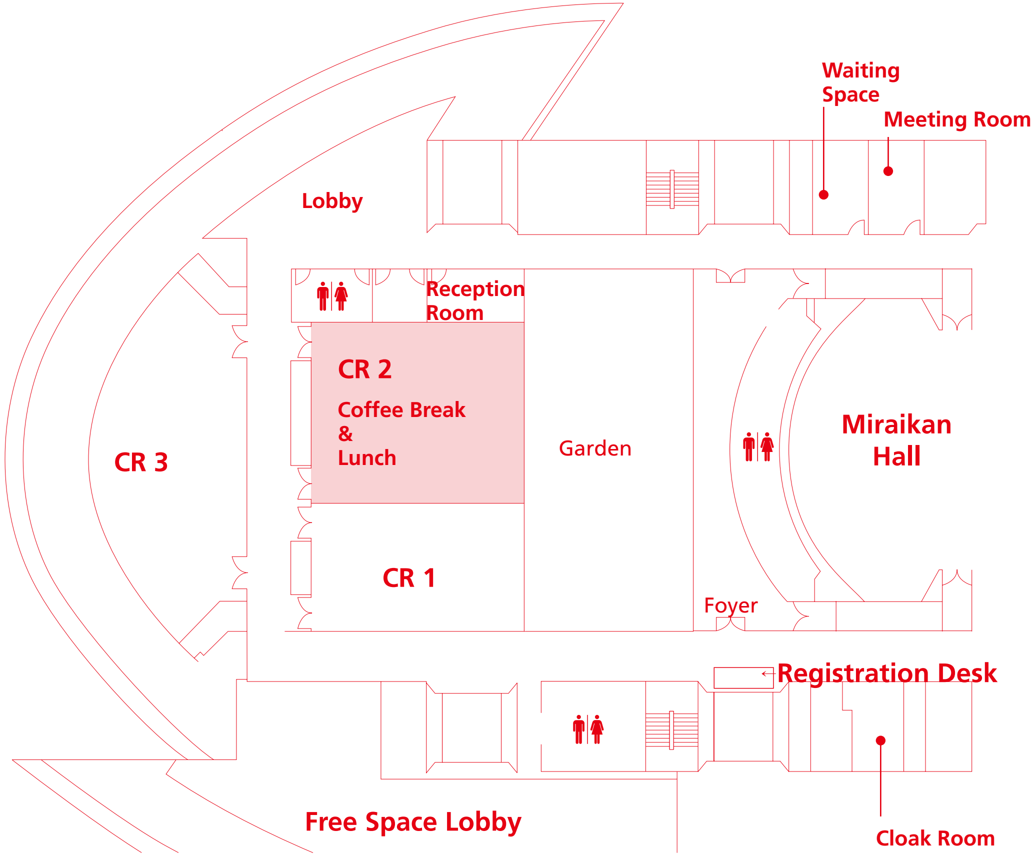
1F



7F



Map - Coffee Break & Lunch



Sun, 3/3

For more information, see page 23.

Time	Place	Title	Authors
08:00		Registration Open	
09:00~17:00 (Full day)	1F OR1	Workshop 1 HRI Face-to-Face: Gaze and Speech Communication	Frank Broz (University of Plymouth) Hagen Lehmann (University of Hertfordshire) Bilge Mutlu (University of Wisconsin-Madison) Yukiko Nakano (Seikei University)
09:00~17:00 (Full day)	7F LNG	Workshop 2 Design of Human Likeness in HRI from Uncanny Valley to Minimal Design	Hidenobu Sumioka, Takashi Minato (ATR) Yoshio Matsumoto (AIST) Pericle Salvini (BioRobotics Institute of Scuola Superiore Sant' Anna) Hiroshi Ishiguro (Osaka University)
09:00~17:00 (Full day)	7F CR2	Workshop 3 Collaborative Manipulation: New Challenges for Robotics and HRI	Anca Dragan (Carnegie Mellon University) Andrea Thomaz (Georgia Institute of Technology) Siddhartha Srinivasa (Carnegie Mellon University)
09:00~12:45 (Half day)	7F CR3	Workshop 4 Applications for Emotional Robots	Oliver Damm, Frank Hegel, Karoline Malchus, Britta Wrede (Bielefeld University) Manja Lohse (University of Twente)
09:00~18:00 (Full day)	7F CR1	Workshop 5 Human-Robot Interaction Pioneers Workshop	Solace Shen (University of Washington) Astrid Rosenthal-von der Pütten (University of Duisburg-Essen)

Mon, 3/4

Time	Place	Title	Authors
08:00		Registration Open	
09:00	7F Miraikan Hall	HRI 2013 Welcome	
09:10~10:10	7F Miraikan Hall	**How Do We Perceive Robots?**	**Chair: Sara Kiesler** (Carnegie Mellon University)
09:10	7F Miraikan Hall	The Influence of Height on Robotic Communication Products	Irene Rae (University of Wisconsin–Madison) Leila Takayama (Willow Garage) Bilge Mutlu (University of Wisconsin–Madison)
09:30	7F Miraikan Hall	Evaluating the Effects of Limited Perception on Interactive Decisions in Mixed Robotic Environments	Aris Valtazanos, Subramanian Ramamoorthy (University of Edinburgh)
09:50	7F Miraikan Hall	Supervisory Control of Multiple Social Robots for Navigation	Kuanhao Zheng, Dylan F. Glas, Takayuki Kanda (ATR) Hiroshi Ishiguro (Osaka University) Norihiro Hagita (ATR)
10:10~10:25	7F CR 2	Break	
10:25~12:05	7F Miraikan Hall	**Groups and Public Places**	**Chair: Bilge Mutlu** (University of Wisconsin–Madison)
10:25	7F Miraikan Hall	Eyewitnesses Are Misled By Human But Not Robot Interviewers	Cindy L. Bethel, Deborah K. Eakin, Sujan Anreddy, James Kaleb Stuart, Daniel Carruth (Mississippi State University)
10:45	7F Miraikan Hall	Human-Robot Cross-Training: Computational Formulation, Modeling and Evaluation of a Human Team Training Strategy	Stefanos Nikolaidis, Julie Shah (Massachusetts Institute of Technology)
11:05	7F Miraikan Hall	Sensors in the Wild: Exploring Electrodermal Activity in Child-Robot Interaction	Iolanda Leite (INESC-ID and IST, Technical University of Lisbon) Rui Henriques (IST, Technical University of Lisbon) Carlos Martinho, Ana Paiva (INESC-ID and IST, Technical University of Lisbon)

Time	Place	Title	Authors
11:25	7F Miraikan Hall	Identifying People with Soft-Biometrics at Fleet Week	Eric Martinson, Wallace Lawson, Greg Trafton (US Naval Research Laboratory)
11:45	7F Miraikan Hall	Understanding Suitable Locations for Waiting	Takuya Kitade (ATR/Keio University) Satoru Satake, Takayuki Kanda (ATR) Michita Imai (ATR/Keio University)
12:05~13:40	Lunch		
13:40~15:00	7F Miraikan Hall	**HRI 2013 Madness**	
15:00~15:30	7F CR 2	Break	
15:30~16:30	7F Miraikan Hall	**Plenary Talk 1: Human-Robot Interaction by Information Sharing**	**Yuichiro Anzai**
16:30~18:00	7F CR1 CR 2	**HRI 2013 Demo Session**	
18:00~20:00	7F CR1 CR2 CR3 Free Space Lobby	**HRI 2013 Late Breaking Reports and Poster Session**	

Tue, 3/5

Time	Place	Title	Authors
08:00		Registration Open	
09:00~10:40	7F Miraikan Hall	**Trust, Help, and Influence**	**Chair: Cindy Bethel (Mississippi State University)**
09:00		Impact of Robot Failures and Feedback on Real-Time Trust	Munjal Desai (University of Massachusetts Lowell) Poornima Kaniarasu (Carnegie Mellon University) Mikhail Medvedev (University of Massachusetts Lowell) Aaron Steinfeld (Carnegie Mellon University) Holly Yanco (University of Massachusetts Lowell)
09:20		Will I Bother Here? – A Robot Anticipating its Influence on Pedestrian Walking Comfort	Hiroyuki Kidokoro, Takayuki Kanda, Drazen Brscic, Masahiro Shiomi (ATR)
09:40		It's Not Polite to Point: Generating Socially-Appropriate Deictic Behaviors towards People	Phoebe Liu, Dylan F. Glas, Takayuki Kanda (ATR) Hiroshi Ishiguro (Osaka University) Norihiro Hagita (ATR)
10:00		How a Robot Should Give Advice	Cristen Torrey (Adobe Systems) Susan Fussell (Cornell University) Sara Kiesler (Carnegie Mellon University)
10:20		Older Adults' Medication Management in the Home: How can Robots Help?	Akanksha Prakash, Jenay M. Beer, Travis Deyle, Cory-Ann Smarr, Tiffany L. Chen, Tracy L. Mitzner, Charles C. Kemp, Wendy A. Rogers (Georgia Institute of Technology)
10:40~11:00	7F CR2	Break	
11:00~12:00	7F Miraikan Hall	**Panel Session**	
12:00~13:40	Lunch		

Time	Place	Title	Authors
13:40~14:40	7F Miraikan Hall	**Journal Session 1**	**Chair: Takayuki Kanda (ATR)**
13:40		Towards Seamless Human-Robot Handovers	Kyle Strabala, Min Kyung Lee, Anca Dragan, Jodi Forlizzi, Siddhartha S. Srinivasa (Carnegie Mellon University) Maya Cakmak (Willow Garage), Vincenzo Micelli (Universita` Degli Studi di Parma)
14:00		Meal-Time with a Socially Assistive Robot and Older Adults at a Long-term Care Facility	Derek McColl (University of Toronto) Goldie Nejat (University of Toronto, Toronto Rehabilitation Institute)
14:20		A Gesture-Centric Android System for Multi-Party Human-Robot Interaction	Yutaka Kondo, Kentaro Takemura, Jun Takamatsu, Tsukasa Ogasawara (Nara Institute of Science and Technology)
14:40~14:50	7F CR 2	Break	
14:50~16:10	7F Miraikan Hall	**Journal Session 2**	**Chair: Mike Goodrich (Brigham Young University)**
14:50		Controlling Social Dynamics with a Parametrized Model of Floor Regulation	Crystal Chao, Andrea L. Thomaz (Georgia Institute of Technology)
15:10		ACT-R/E: An Embodied Cognitive Architecture for Human-Robot Interaction	J. Gregory Trafton, Laura M. Hiatt, Anthony M. Harrison, Franklin P. Tamborello, II, Sangeet S. Khemlani, & Alan C. Schultz (Naval Research Laboratory)
15:30		A User Study on Kinesthetic Teaching of Redundant Robots in Task and Configuration Space	Sebastian Wrede, Christian Emmerich, Ricarda Grünberg, Arne Nordmann, Agnes Swadzba, Jochen Steil (Bielefeld University)
15:50		Crowdsourcing Human-Robot Interaction: New Methods and System Evaluation in a Public Environment	Cynthia Breazeal, Nick DePalma, Jeff Orkin (Massachusetts Institute of Technology), Sonia Chernova (Worcester Polytechnic Institute), Malte Jung (Stanford University)
16:10~16:30	7F CR 2	Break	
16:30~		Visits Bus visit to the University of Tokyo: Intelligent Systems and Informatics Lab, Jouhou System Kougaku Lab, and Nakamura Lab Lab visit to AIST (Advanced Industrial Science and Technology) Tokyo Waterfront, Digital Human Research Center	

Wed, 3/6

Time	Place	Title	Authors
08:00		Registration Open	
09:00~10:20	7F Miraikan Hall	**Companions, Collaboration, and Control**	**Chair: Greg Trafton (Naval Research Laboratory)**
09:00		Communicating Affect via Flight Path: Exploring Use of the Laban Effort System for Designing Affective Locomotion Paths	Megha Sharma, Dale Hildebrandt, Gem Newman, James E. Young, Rasit Eskicioglu (University of Manitoba)
09:20		Legibility and Predictability of Robot Motion	Anca D. Dragan (Carnegie Mellon University), Kenton C.T. Lee (University of Pennsylvania) Siddhartha S. Srinivasa (Carnegie Mellon University)
09:40		Taking Your Robot For a Walk: Force-Guiding a Mobile Robot Using Compliant Arms	François Ferland, Arnaud Aumont, Dominic Letourneau, François Michaud (Universite de Sherbrooke)
10:00		Effects of Robotic Companionship on Music Enjoyment and Agent Perception	Guy Hoffman, Keinan Vanunu (IDC Herzliya)
10:20~10:40	7F CR2	Break	
10:40~12:00	7F Miraikan Hall	**Verbal and Non-Verbal Behavior**	**Chair: Leila Takayama (Willow Garage)**
10:40		A Model for Synthesizing a Combined Verbal and NonVerbal Behavior Based on Personality Traits in Human-Robot Interaction	Amir Aly, Adriana Tapus (ENSTA-ParisTech)
11:00		Automatic Processing of Irrelevant Co-Speech Gestures with Human but not Robot Actors	Cory J. Hayes, Charles R. Crowell, Laurel D . Riek (University of Notre Dame)
11:20		Rhetorical Robots: Making Robots More Effective Speakers Using Linguistic Cues of Expertise	Sean Andrist, Erin Spannan, Bilge Mutlu (University of Wisconsin–Madison)
11:40		Gestures for Industry: Intuitive Human-Robot Communication from Human Observation	Brian Gleeson, Karon MacLean, Amir Haddadi, Elizabeth Croft (University of British Columbia), Javier Alcazar (General Motors)

Time	Place	Title	Authors
12:00~13:40	Lunch		
13:40~15:20	7F Miraikan Hall	**Is The Robot like Me?**	**Chair: Fumihide Tanaka (Tsukuba Univ.)**
13:40		Expressing Ethnicity through Behaviors of a Robot Character	Maxim Makatchev, Reid Simmons (Carnegie Mellon University), Majd Sakr, Micheline Ziadee (CMU Qatar)
14:00		The Inversion Effect in HRI: Are Robots Perceived More Like Humans or Objects?	Jakub Zlotowski, Christoph Bartneck (University of Canterbury)
14:20		A Transition Model for Cognitions about Agency	Daniel T. Levin, Julie A. Adams, Megan M. Saylor, Gautam Biswas (Vanderbilt University)
14:40		Presentation of (Telepresent) Self: On the Double-Edged Effects of Mirrors	Leila Takayama (Willow Garage), Helen Harris (Stanford University)
15:00		Are You Looking At Me?: Perception of Robot Attention is Mediated by Gaze Duration and Group Size	Henny Admoni, Bradley Hayes, David Feil-Seifer, Daniel Ullman, Brian Scassellati (Yale University)
15:20~15:40	7F CR 2	Break	
15:40~16:40	7F Miraikan Hall	**Video Session**	
16:40~17:40		**Plenary Talk 2: The Creation of a New Robot Era**	**Tomotaka Takahashi**
17:40~18:00		**Closing and Award**	

Visits

1. Sun, 3/3, Miraikan
13:00~15:00

Guided visit of the National Museum of Emerging Science and Innovation (Miraikan): Demonstrations of Honda ASIMO, Honda UNI-CUB, GEOCOSMOS, etc.

(No extra cost, max 20 persons)

2. Tue, 3/5, University of Tokyo
16:30~20:30

Bus visit to the University of Tokyo: Intelligent Systems and Informatics Lab, Jouhou System Kougaku Lab, and Nakamura Lab

(Extra 38 USD, Max 40 persons and canceled if attendees are less than 10persons)

3. Tue, 3/5, AIST
16:30~19:00

Lab visit to AIST (Advanced Industrial Science and Technology) Tokyo Waterfront, Digital Human Research Center

(No extra cost, max 60 persons)

Tutorials & Workshops

Workshop coffee breaks are from 11:00~11:20 and 15:00~15:30, and the lunch box shop will be open from 12:00~13:30.

Workshop 1 (Full day):
HRI Face-to-Face: Gaze and Speech Communication

Sun, 3/3 (09:00~17:00)
OR1 (Orientation Room 1), 1F

Frank Broz (University of Plymouth),
Hagen Lehmann (University of Hertfordshire),
Bilge Mutlu (University of Wisconsin-Madison),
Yukiko Nakano (Seikei University)

The purpose of this workshop is to explore the relationship between gaze and speech during "face-to-face" human-robot interaction. As advances in speech recognition have made speech-based interaction with robots possible, it has become increasingly apparent that robots need to exhibit nonverbal social cues in order to disambiguate and structure their spoken communication with humans. Gaze behavior is one of the most powerful and fundamental sources of supplementary information to spoken communication. Gaze structures turn-taking, indicates attention, and implicitly communicates information about social roles and relationships. There is a growing body of work on gaze and speech based interaction in HRI, involving both the measurement and evaluation of human speech and gaze during interaction with robots and the design and implementation of robot speech and accompanying gaze behavior for interaction with humans.

Workshop 2 (Full day):
Design of Human Likeness in HRI from Uncanny Valley to Minimal Design

Sun, 3/3 (09:00~17:00)
LNG (Lounge Room), 7F

Hidenobu Sumioka, Takashi Minato (ATR),
Yoshio Matsumoto (AIST),
Pericle Salvini (BioRobotics Institute of Scuola Superiore Sant' Anna),
Hiroshi Ishiguro (Osaka University)

Human likeness of social agents is crucial for human partners to interact with the agents intuitively since it makes the partners unconsciously respond to the agents in the same manner as what they show to other people. Although many studies suggest that an agent's human likeness plays an important role in human-robot interaction, it remains unclear how to design humanlike form that evokes interpersonal behavior from human partners. One approach is to make a copy of an existing person. Although this extreme helps us explore how we recognize another person, the Uncanny Valley effect must be taken into account. Basic questions, including why we experience the uncanny valley and how we overcome it should be addressed to give new insights into an underlying mechanism in our perception of human likeness. Another approach is to extract crucial elements that represent human appearance and behavior, as addressed in design of computer-animated human characters. The exploration of minimal requirement to evoke interpersonal behavior from human partners provides more effective and simpler way to design social agents that facilitate communication with human. This full-day workshop aims to bring together the prominent researchers from different backgrounds in order to present and discuss the most recent achievement in design of humanlike in a wide range of research topics from uncanny valley effects and minimal design of human-robot communication.

Workshop 3 (Full day):

Collaborative Manipulation: New Challenges for Robotics and HRI

Sun, 3/3 (09:00~17:00)
CR2 (Conference Room 2), 7F

Anca Dragan (Carnegie Mellon University),
Andrea Thomaz (Georgia Institute of Technology),
Siddhartha Srinivasa (Carnegie Mellon University)

Autonomous manipulation has made tremendous progress in recent years, leveraging new algorithms and capabilities of mobile manipulators to address complex human environments. However, most current systems inadequately address one key feature of human environments: that they are populated with humans. What would it take for a human and robot to prepare a meal together in a kitchen, or to assemble a part together in a manufacturing workcell? Collaboration with humans is the next frontier in robotics, be it shared workspace collaboration, assistive teleoperation and sliding autonomy, or teacher-l earner collaboration, and raises new challenges for both robotics and HRI. A collaborative robot must engage in a delicate dance of prediction and action, where it must understand its collaborator's intentions, act to make its own intentions clear, decide when to assist and when to back off, as well as continuously adapt its behavior and enable customization. Addressing these challenges demands a joint effort from the HRI and robotics communities. We hope that this workshop will not only serve to attract more roboticists into the HRI community under this unifying theme, but will also create valuable collaborations to explore this rich, interdisciplinary area. We welcome high-quality work in all areas related to collaborative manipulation.

Workshop 4 (Half day):

Applications for Emotional Robots

Sun, 3/3 (09:00~12:45)
CR3 (Conference Room 3), 7F

Oliver Damm, Frank Hegel (Bielefeld University),
Manja Lohse (University of Twente),
Karoline Malchus, Britta Wrede
(Bielefeld University)

In social interaction between humans expressing, recognizing, and understanding emotions is essential. Therefore, artificial emotions are also being exploited to improve human-robot interaction (HRI) and to build robots that interact in a more human-like and intuitive manner. Some characteristics of this kind of robots are to express/perceive emotions, to communicate with (highlevel) dialogues, to learn/recognize models of other agents, to establish and maintain social relationships, and to develop social competencies. These socially interactive robots are used for different purposes, e.g. as toys, as educational tools, or as research platforms. Thus, for the engineering side of robotic research it is necessary to create robots for specific contexts, requirements, and expectations. With this half day workshop we open up a platform to discuss different interdisciplinary perspectives on the application of robots that are able to display and perceive emotions. We want to develop an idea of how the context influences the characteristics that an emotional robot needs to have and to gain new insights in the role of emotions in HRI.

Workshop 5 (Full day):

Human-Robot Interaction Pioneers Workshop

Sun, 3/3 (09:00~18:00)
CR1 (Conference Room 1), 7F

Solace Shen (University of Washington),
Astrid Rosenthal-von der Pütten
(University of Duisburg-Essen)

The eighth annual Human-Robot Interaction Pioneers Workshop will be held in Tokyo, Japan on Sunday, March 3rd, 2013. Exploring human-robot interaction in a welcoming and interactive forum, HRI Pioneers is the premiere venue for up-and-coming student researchers in the field. This highly selective workshop is designed to empower innovators early in their careers and assembles together a cohort of the world's top student researchers seeking to foster creativity, communication, and collaboration across the incredibly diverse field of human-robot interaction. Workshop participants will have the opportunity to learn about the current state of HRI, to present their research, and to network with one another and with select senior HRI researchers. **We warmly welcome and invite all conference participants to join us for the Pioneers Poster Session from 14:00 to 15:00!** Participation in the Pioneers Workshop is determined through an independent competitive application process (deadline December 3, 2012). For more information, and details on how to apply, please visit the workshop website at: http://www.hripioneers.info/

2013
TOKYO/JAPAN

Plenary Talk 1

Mon, 3/4 (15:30~16:30)
7F Miraikan Hall

Human-Robot Interaction by Information Sharing

Yuichiro Anzai

Abstract

In the plenary talk addressed at ROMAN92, considered as the first scientific meeting for human-robot interaction [1], I noted that 'one of the noticeable features of the current work on human-robot communication is that it generally lacks attention to computer science, particularly to human-computer interaction' [2]. Until that time the field of HRI had been covered by industrial robotics, remote control and augmented reality, and much less attention had been paid to interaction per se, or the design of interactive systems supported by computers and computer network technology.

Twenty years after, we are in a very fruitful period of time for the development of HRI, with the plentiful contribution of many researchers and developers with challenging minds. We are now fully aware that HRI is a growing and prospering field of research, related deeply with the neighboring field of human-computer interaction. A notably wide spectrum of work has been developed, from theories and models to the design and implementation of interactive systems, and further to a variety of applications such as control, assistance, rescue and entertainment.

At least two points are essential as the backgrounds of the research of both HRI as a whole and our own. The first point is that human-centric analysis and design is indispensable for HRI, however, it needs to be based upon, or augmented by, the solid foresight and implementation of advanced technology from robotics and control engineering to computer and communication sciences. The development of HRI shall be on the dynamic balance between humans and technology, that is, it must be on the trajectory of an ellipse with two foci – humans and technology. HRI can metaphorically be a point on an ellipse's trajectory whose sum of the distances from the human focus and the technology focus is constant.

The second point is that we need some central or transversal concepts that play a leading role in the design and management of HRI. Though there are several strong candidates, I chose the concept of information sharing, referring to the state of interaction where interacting systems, or agents, share information. This notion of interaction is much related to the concept of phatic communion proposed by B.K.Malinowski as early as in the 1920's [3] in the context of linguistic communication, as well as to those of knowing and believing that have been dealt with in cognitive science and artificial intelligence.

With these contexts and backgrounds in hand, the talk is three-fold. First, I provide a brief survey of the past and present status, as well as some future prospect, of HRI research, particularly based on the meta-model of an ellipse with the human focus and the technology focus.

Second, let me talk about the results from our HRI project, named PRIME (Physically-grounded human-Robot-computer Interaction in Multi-agent Environment) started in April 1991 as a particular example of the development upon the ellipse model. Within PRIME project, my colleagues, students and I developed and implemented a variety of hardware, software, interface systems and artificial intelligence systems such as a module-based hardware, a real-time basic software, a middleware for sensor networks and human-robot interactive systems including multiple robot systems.

The third topic in the talk is to provide, from the viewpoint of information sharing, the more recent development of HRI research that has been done since 2001 at my lab, now Imai lab led by Michita Imai, at Keio University, with colleagues at ATR laboratories and other institutions. It includes examples of the research on sharing social protocols, attention, eye gaze, word meanings, cognitive spaces, gestures and empathy in human-robot interaction.

HRI is a growing and enlarging field that is open to anyone interested in the interaction of humans and robots: the talk touches only bits of its enchantment, especially from my own experience and viewpoints. Yet I bet that it contains some important bits for the prospect of HRI research to contribute to the future of humans and their society.

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Biography

Yuichiro Anzai started research on human cognitive processes and machine learning in mid 1970's, and spent 1976-78 and 1981-82 at Carnegie-Mellon University as a post-doc and a visiting assistant professor, respectively. After coming back to his country, he has kept working on learning and problem solving as well as doing extensive research on human-robot interaction since 1991 at Keio University and Hokkaido University. He published numerous academic papers and books, including Pattern Recognition and Machine Learning, Concepts and Characteristics of Knowledge-based Systems (co-ed) and Symbiosis of Human and Artifact Vols. 1 and 2 (co-ed).

He spent eight years as Dean of Faculty of Science and Technology, Keio University (1993-2001), then eight more years as President of the same university (2001-09), while he led with his colleagues a large-scale commemorative project for Keio's 150th anniversary. In October 2011 he accepted the present position of President, Japan Society for the Promotion of Science, the representative research funding agency in Japan, keeping the position of Executive Academic Advisor for Keio University.

Anzai has been Chairperson of University Subcouncil, Central Council for Education, Ministry of Education, Culture, Science, Sports and Technology (MEXT), as well as many others. His past public contribution includes Advisor to MEXT (2010-11), Chairperson of Association of Pacific Rim Universities (2008-09), Member of the Science Council of Japan (2005-11), and President of the Information Processing Society of Japan (2005-07) and Japanese Cognitive Science Society (1993-94).

The awards received by Anzai include Medal with Purple Ribbon from the Japanese Government, Commandeur de l'Ordre des Palmes Académiques from the French Government, and honorary doctoral degrees from Yonsei University in Seoul and École Centrale de Nantes in Nantes. He received M.S. in 1971 and Ph.D. in 1974 from Keio University.

Plenary Talk 2

Wed, 3/6 (16:40~17:40)
7F Miraikan Hall

The Creation of a New Robot Era

Tomotaka Takahashi

Abstract

In recent years, it may seem that technology trend is in a regression process, from technology itself to humanlike aspects. Then, intuitive and comfortable operating environment and the technology which enables such environment become to draw an attention, rather than what we called "high performance" "high specifications" whose advertising message simply speaks as is today.

A sense of distance between human and mechatronics products becomes much smaller accordingly, and available information in an interactive manner drastically swollen out of our daily life. Compact humanoid robot which may communicate with us, stands at the very leading edge of technology roadmap. It might be like a smart phone with arms and legs or a state-of-the-art "Tinker Bell", and everyone can involve in information exchange in casual conversation via such humanoids.

We can enjoy innocent conversation with humanoid, due to a kind of personification. As a result it allows us to gather our daily life information and to utilize them for command and control purpose on any mechatronics products, services and information. I would like to discuss such future life with intelligent humanoid, which would be realized in the next 15 years, with certain demonstration of a latest humanoid.

Biography

Founder and CEO of Robo Garage, research associated professor of The University of Tokyo, visiting professor of Fukuyama University and Osaka Electro-Communication University. Solely research, develop, design, and manufacture humanoid robots from scratch. Master pieces are Ropid, Chroino, FT, Evolta, Tachikoma, and Vision.

Awards; TIME magazine 'Coolest Inventions 2004', Popular Science magazine '33 persons changing the future', Guinness world record of long distance remote controlled robot car, and Robo-cup world champion 2004-2008.

Panel Session

Tue, 3/5 (11:00~12:00)
7F Miraikan Hall

Panel:
Revisioning HRI Given Exponential Technological Growth
Session Chair: Peter H. Kahn, Jr., University of Washington

Sometimes it's said that the technical problems in robotics are harder and more intransigent than the field ever expected decades ago. That's often the preamble to the sort of statement: "And those of us in HRI need to be realistic about what robots actually will be able to do in the near future." This panel explores the idea that that view – of slow technological growth – is fundamentally wrong. Our springboard is Ray Kurzweil's idea from his book *The Singularity is Near*. He argues that our minds think in linear terms while the technological change is increasing exponentially. To illustrate exponential growth, take a dollar and double it every day. After a week, you have $64, which is hardly much to shout about. After a month you have over a billion dollars. Kurzweil shows that we're at the "knee" of that exponential curve, where technological growth has begun to accelerate at an increasingly astonishing rate. Given this proposition, the panelists discuss how we should be revisioning the field of HRI.

Panelists:

Gerhard Sagerer
Bielefeld University (Germany)

Gerhard Sagerer is Rektor of Bielefeld University, and Professor of Applied Informatics at Bielefeld University's Faculty of Technology. He studied Informatics at the University of Erlangen-Nürnberg, where he took his doctorate in 1985. His interests include cognitive and social robotics, human–robot interaction, speech and dialogue systems, and the architecture of intelligent systems. He has served as coordinator and member of the executive board for numerous EU projects and Collaborative Research Centres. He is also on the Scientific Board of the German Section of Computer Scientists for Peace and Social Responsibility.

Andrea L. Thomaz
Georgia Institute of Technology (United States)

Andrea Thomaz is an Assistant Professor of Interactive Computing at the Georgia Institute of Technology. She joined the faculty in 2007. She earned a B.S. in Electrical and Computer Engineering from the University of Texas at Austin in 1999, and Sc.M. and Ph.D. degrees from MIT in 2002 and 2006. She is published in the areas of Artificial Intelligence, Robotics, Human-Robot Interaction, and Human-Computer Interaction. She directs the Socially Intelligent Machines lab, which is affiliated with the Robotics and Intelligent Machines (RIM) Center and with the Graphics Visualization and Usability (GVU) Center.

Takayuki Kanda
ATR (Japan)

Takayuki Kanda is Senior Research Scientist at ATR Intelligent Robotics and Communication Laboratories, Kyoto, Japan. He received his B. Eng, M. Eng, and Ph. D. degrees in computer science from Kyoto University, Kyoto, Japan, in 1998, 2000, and 2003, respectively. He is one of the starting members of Communication Robots project at ATR. He has developed a communication robot, Robovie, and applied it in daily situations, such as in peer-tutoring at an elementary school and as a museum exhibit guide. His research focuses on human-robot interaction with interactive humanoid robots, often conducted through field studies.

Peter H. Kahn, Jr.
University of Washington (United States)

Peter Kahn is Professor in the Department of Psychology and Director of the Human Interaction with Nature and Technological Systems (HINTS) Lab at the University of Washington. The HINTS Lab seeks to address - from an ethical stance - two world trends that are powerfully reshaping human existence: (1) the degradation if not destruction of large parts of the natural world, and (2) unprecedented technological development, both in terms of its computational sophistication and pervasiveness. He has published five books with MIT Press, including *Technological Nature: Adaptation and the Future of Human Life.*

Mon, 3/4
Miraikan Hall

• 09:10~10:10

How Do We Perceive Robots?

Chair: Sara Kiesler
(Carnegie Mellon University)

The Influence of Height on Robotic Communication Products (09:10)

Irene Rae (University of Wisconsin–Madison), **Leila Takayama** (Willow Garage), **Bilge Mutlu** (University of Wisconsin–Madison)

A large body of research in human communication has shown that a person's height plays a key role in how persuasive, attractive, and dominant others judge the person to be. Robotic telepresence systems---systems that combine video-conferencing capabilities with robotic navigation to allow geographically dispersed people to maneuver in remote locations---represent remote users, operators, to local users, locals, through the use of an alternate physical representation. In this representation, physical characteristics such as height are dictated by the manufacturer of the system. We conducted a two-by-two (relative system height: shorter vs. taller; team role: leader vs. follower), between-participants study (n = 40) to investigate how the system's height affects the local's perceptions of the operator and subsequent interactions. Our findings show that, when the system was shorter than the local and the operator was in a leadership role, the local found the operator to be less persuasive. Furthermore, having a leadership role significantly affected the local's feelings of dominance with regard to being in control of the conversation.

Evaluating the Effects of Limited Perception on Interactive Decisions in Mixed Robotic Environments (09:30)

Aris Valtazanos, Subramanian Ramamoorthy (University of Edinburgh)

Many robotic applications feature a mixture of interacting teleoperated and autonomous robots. In several such domains, human operators must make decisions using very limited perceptual information, e.g. by viewing only the noisy camera feed of their robot. There are many interaction scenarios where such restricted visibility impacts teleoperation performance, and where the role of autonomous robots needs to be reinforced. In this paper, we report on an experimental study assessing the effects of limited perception on human decision making, in interactions between autonomous and teleoperated NAO robots, where subjects do not have prior knowledge of how other agents will respond to their decisions. We evaluate the performance of several subjects under varying perceptual constraints in two scenarios; a simple cooperative task requiring collaboration with an autonomous robot, and a more demanding adversarial task, where an autonomous robot is actively trying to outperform the human. Our results indicate that limited perception has minimal impact on user performance when the task is simple. By contrast, when the other agent becomes more strategic, restricted visibility has an adverse effect on most subjects, with the performance level even falling below that achieved by an autonomous robot with identical restrictions. Our results could inform decisions about the division of control between humans and robots in mixed-initiative systems, and in determining when autonomous robots should intervene to assist operators.

Supervisory Control of Multiple Social Robots for Navigation (09:50)

Kuanhao Zheng, Dylan F. Glas, Takayuki Kanda (ATR), **Hiroshi Ishiguro** (Osaka University), **Norihiro Hagita** (ATR)

This paper presents a human study and system implementation for the supervisory control of multiple social robots for navigational tasks. We studied the acceptable range of speed for robots interacting with people through navigation, and we discovered that entertaining people by speaking during navigation can increase peoples tolerance toward robots' slow locomotion speed. Based on these results and using a robot safety model developed to ensure safety of robots during navigation, we implemented an algorithm which can proactively adjust robot behaviors during navigation to improve the performance of a human-robot team consisting of a single operator and multiple mobile social robots. Finally, we implemented a semi-autonomous robot system and conducted experiments in a shopping mall to verify the effectiveness of our proposed methods in a real-world environment.

• 10:25~12:05

Groups and Public Places

Chair: Bilge Mutlu
(University of Wisconsin–Madison)

Eyewitnesses Are Misled By Human But Not Robot Interviewers (10:25)

Cindy L. Bethel, Deborah K. Eakin, Sujan Anreddy, James Kaleb Stuart, Daniel Carruth (Mississippi State University)

This paper presents research results from a study to determine whether eyewitness memory was impacted by a human interviewer versus a robot interviewer when presented misleading post-event information. The study was conducted with 101 participants who viewed a slideshow depicting the events of a crime. All of the participants interacted with the humanoid robot, NAO, by playing a trivia game. Participants were then interviewed by either a human or a robot interviewer that presented either control or misleading information about the events depicted in the slideshow. This was followed by another filler interval task of trivia with the robot. Following the interview and robot interactions, participants completed a paper-pencil post-event memory test to determine their recall of the events of the slideshow. The results indicated that eyewitnesses were misled by a human interviewer ($t(46) = 2.79$, $p < 0.01$, $d = 0.83$) but not by a robot interviewer ($t(46) = 0.34$, $p > 0.05$). The results of this research could have strong implications for the gathering of sensitive information from an eyewitness about the events of a crime.

Human-Robot Cross-Training: Computational Formulation, Modeling and Evaluation of a Human Team Training Strategy (10:45)

Stefanos Nikolaidis, Julie Shah (Massachusetts Institute of Technology)

We design and evaluate human-robot cross-training, a strategy widely used and validated for effective human team training. Cross-training is an interactive planning method in which a human and a robot iteratively switch roles to learn a shared plan for a collaborative task. We first present a computational formulation of the robot's interrole knowledge and show that it is quantitatively comparable to the human mental model. Based on this encoding, we formulate human-robot cross-training and evaluate it in human subject experiments (n = 36). We compare human-robot cross-training to standard reinforcement learning techniques, and show that cross-training provides statistically significant improvements in quantitative team performance measures. Additionally, significant differences emerge in the perceived robot performance and human trust. These results support the hypothesis that effective and fluent human-robot teaming may be best achieved by modeling effective practices for human teamwork.

Sensors in the Wild: Exploring Electrodermal Activity in Child-Robot Interaction (11:05)

Iolanda Leite (INESC-ID and IST, Technical University of Lisbon), **Rui Henriques** (IST, Technical University of Lisbon), **Carlos Martinho, Ana Paiva** (INESC-ID and IST, Technical University of Lisbon)

Recent advances in biosensor technology enabled the appearance of commercial wireless sensors that can measure electrodermal activity (EDA) in user's everyday settings. In this paper, we investigate the potential benefits of measuring EDA to better understand children-robot interaction in two distinct directions: to characterize and evaluate the interaction, and to dynamically recognize user's affective states. To do so, we present a study in which 38 children interacted with an iCat robot while wearing a wireless sensor that measured their electrodermal activity. We found that different patterns of electrodermal variation emerge for different supportive behaviours elicited by the robot and for different affective states of the children. The results also yield significant correlations between statistical features extracted from the signal and surveyed parameters regarding how children perceived the interaction and their affective state.

Identifying People with Soft-Biometrics at Fleet Week (11:25)

Eric Martinson, Wallace Lawson, Greg Trafton (US Naval Research Laboratory)

Person identification is a fundamental robotic capability for long-term interactions with people. It is important to know with whom the robot is interacting for social reasons, as well as to remember user preferences and interaction histories. There exist, however, a number of different features by which people can be identified. This work describes three alternative, soft biometrics (clothing, complexion, and height) that can be learned in real-time and utilized by a humanoid robot in a social setting for person identification. The use of these biometrics is then evaluated as part of a novel experiment in robotic person identification carried out at Fleet Week, New York City in May, 2012. In this experiment, Octavia employed soft biometrics to discriminate between groups of 3 people. 202 volunteers interacted with Octavia as part of the study, interacting with the robot from multiple locations in a challenging environment.

Understanding Suitable Locations for Waiting (11:45)

Takuya Kitade (ATR/Keio University), **Satoru Satake, Takayuki Kanda** (ATR), **Michita Imai** (ATR/Keio University)

This study addresses the robot that waits for users while they shop. In order to wait, the robot needs to understand which locations are appropriate for waiting. We investigated how people choose locations for waiting, and revealed that they are concerned with disturbing pedestrians and disturbing shop activities. Using these criteria, we developed a classifier of waiting locations. Disturbing pedestrians are estimated from statistics of pedestrian trajectories, which is observed with a human-tracking system based on laser range finders. Disturbing shop activities are estimated based on shop visibility. We evaluated this autonomous waiting behavior in a shopping-assist scenario. The experimental results revealed that users found the autonomous waiting robot chose appropriate waiting locations for waiting more than a robot with random choice or one controlled manually by the user him or herself.

Tue, 3/5 Miraikan Hall

• 09:00~10:40

Trust, Help, and Influence

Chair: Cindy Bethel (Mississippi State University)

Impact of Robot Failures and Feedback on Real-Time Trust (09:00)

Munjal Desai (University of Massachusetts Lowell), **Poornima Kaniarasu** (Carnegie Mellon University), **Mikhail Medvedev** (University of Massachusetts Lowell), **Aaron Steinfeld** (Carnegie Mellon University), **Holly Yanco** (University of Massachusetts Lowell)

Prior work in human trust of autonomous robots suggests the timing of reliability drops impact trust and control allocation strategies. However, trust is traditionally measured post-run, thereby masking the real-time changes in trust, reducing sensitivity to factors like inertia, and subjecting the measure to biases like the primacy-recency effect. Likewise, little is known on how feedback of robot confidence interacts in real-time with trust and control allocation strategies. An experiment to examine these issues showed trust loss due to early reliability drops is masked in traditional post-run measures, trust demonstrates inertia, and feedback alters allocation strategies independent of trust. The implications of specific findings on development of trust models and robot design are also discussed.

Will I Bother Here? – A Robot Anticipating its Influence on Pedestrian Walking Comfort (09:20)

Hiroyuki Kidokoro, Takayuki Kanda, Drazen Brscic, Masahiro Shiomi (ATR)

A robot working among pedestrians can attract crowds of people around it, and consequentially become a bothersome entity causing congestion in narrow spaces. To address this problem, our idea is to endow the robot with capability to understand humans' crowding phenomena. The proposed mechanism consists of three underlying models: a model of pedestrian flow, a model of pedestrian interaction, and a model of walking comfort. Combining these models a robot is able to simulate hypothetical situations where it navigates between pedestrians, and anticipate the degree to which this would affect the pedestrians' walking comfort. This idea is implemented in a friendly-patrolling scenario. During planning, the robot simulates the interaction with pedestrian crowd and determines the best path to roam. The result of a field experiment demonstrated that with the proposed method the pedestrians around the robot perceived better walking comfort than pedestrians around the robot that only maximized its exposure.

It's Not Polite to Point: Generating Socially-Appropriate Deictic Behaviors towards People (09:40)

Phoebe Liu, Dylan F. Glas, Takayuki Kanda (ATR), **Hiroshi Ishiguro** (Osaka University), **Norihiro Hagita** (ATR)

Pointing behaviors are used for referring to objects and people in everyday interactions, but the behaviors used for referring to objects are not necessarily polite or socially appropriate for referring to humans. In this study, we confirm that although people would point precisely to an object to indicate where it is, they were hesitant to do so when pointing to another person. We propose a model for generating socially-appropriate deictic behaviors in a robot. The model is based on balancing two factors: understandability and social appropriateness. In an experiment with a robot in a shopping mall, we found that the robots deictic behavior was perceived as more polite, more natural, and better overall when using our model, compared with a model considering understandability alone.

How a Robot Should Give Advice (10:00)

Cristen Torrey (Adobe Systems), **Susan Fussell** (Cornell University), **Sara Kiesler** (Carnegie Mellon University)

With advances in robotics, robots can give advice and help using natural language. The field of HRI, however, has not yet developed a communication strategy for giving advice effectively. Drawing on literature in politeness and informal speech, we propose options for a robot's help-giving speech-using hedges or discourse markers, both of which can mitigate the commanding tone implied in direct statements of advice. To test these options, we experimentally compared two help-giving strategies depicted in videos of human and robot helpers. We found that when robot and human helpers used a hedge or discourse markers, they seemed more considerate and likeable, and less controlling. The robot that used discourse markers had even more impact than the human helper. The findings suggest that communication strategies derived from speech used when people help each other in natural settings can be effective for planning the help dialogues of robotic assistants.

Older Adults' Medication Management in the Home: How can Robots Help? (10:20)

Akanksha Prakash, Jenay M. Beer, Travis Deyle, Cory-Ann Smarr, Tiffany L. Chen, Tracy L. Mitzner, Charles C. Kemp, Wendy A. Rogers (Georgia Institute of Technology)

Successful management of medications is critical to maintaining healthy and independent living for older adults. However, medication non-adherence is a common problem with a high risk for severe consequences, which can jeopardize older adults chances to age in place. Well-designed robots assisting with medication management tasks could support older adults independence. Design of successful robots will be enhanced through understanding concerns, attitudes, and preferences for medication assistance tasks. We assessed older adults reactions to medication hand-off from a mobile manipulator with 12 participants (68-79 years). We identified factors that affected their attitudes toward a mobile manipulator for supporting general medication management tasks in the home. The older adults were open to robot assistance; however, their preferences varied depending on the nature of the medication management task. For instance, they preferred a robot (over a human) to remind them to take medications, but preferred human assistance for deciding what medication to take and for administering the medication. Factors such as perceptions of ones own capability and robot reliability influenced their attitudes.

• 13:40~14:40

Journal Session 1

Chair: Takayuki Kanda (ATR)

Toward Seamless Human–Robot Handovers (13:40)

Kyle Strabala, Min Kyung Lee, Anca Dragan, Jodi Forlizzi, Siddhartha S. Srinivasa (Carnegie Mellon University), **Maya Cakmak** (Willow Garage), **Vincenzo Micelli** (Universita` Degli Studi di Parma)

A handover is a complex collaboration, where actors coordinate in time and space to transfer control of an object. This coordination comprises two processes: the physical process of moving to get close enough to transfer the object, and the cognitive process of exchanging information to guide the transfer. Despite this complexity, we humans are capable of performing handovers seamlessly in a wide variety of situations, even when unexpected. This suggests a common procedure that guides all handover interactions. Our goal is to codify that procedure.

To that end, we first study how people hand over objects to each other in order to understand their coordination process and the signals and cues that they use and observe with their partners. Based on these studies, we propose a coordination structure for human–robot handovers that considers the physical and social-cognitive aspects of the interaction separately. This handover structure describes how people approach, reach out their hands, and transfer objects while simultaneously coordinating the what, when, and where of handovers: to agree that the handover will happen (and with what object), to establish the timing of the handover, and to decide the configuration at which the handover will occur. We experimentally evaluate human–robot handover behaviors that exploit this structure and offer design implications for seamless human–robot handover interactions.

Meal-Time with a Socially Assistive Robot and Older Adults at a Long-term Care Facility (14:00)

Derek McColl (University of Toronto), **Goldie Nejat** (University of Toronto, Toronto Rehabilitation Institute)

As people get older, their ability to perform basic self-maintenance activities can be diminished due to the prevalence of cognitive and physical impairments or as a result of social isolation. The objective of our work is to design socially assistive robots capable of providing cognitive assistance, targeted engagement, and motivation to elderly individuals, in order to promote participation in self-maintenance activities of daily living. In this paper, we present the design and implementation of the expressive human-like robot, Brian 2.1, as a social motivator for the important activity of eating meals. An exploratory study was conducted at an elderly care facility with the robot and eight individuals, ages 82-93, to investigate user engagement and compliance during meal-time interactions with the robot along with overall acceptance and attitudes toward the robot. Results of the study show that the individuals were both engaged in the interactions and complied with the robot during two different meal-eating scenarios. A post-study robot acceptance questionnaire also determined that, in general, the participants enjoyed interacting with Brian 2.1 and had positive attitudes toward the robot for the intended activity.

A Gesture-Centric Android System for Multi-Party Human-Robot Interaction (14:20)

Yutaka Kondo, Kentaro Takemura, Jun Takamatsu, Tsukasa Ogasawara (Nara Institute of Science and Technology)

Natural body gesturing and speech dialogue is crucial for human-robot interaction (HRI) and human-robot symbiosis. Real interaction is not only with one-to-one communication but also among multiple people. We have therefore developed a system that can adjust gestures and facial expressions based on a speaker's location or situation for multi-party communication. By extending our already developed real-time gesture planning method, we propose a gesture adjustment suitable for human demand through motion parameterization and gaze motion planning, which allows communication through eye-to-eye contact. We implemented the proposed motion planning method on an android Actroid-SIT and we proposed to use a Key-Value Store to connect the components of our systems. The Key-Value Store is a high-speed and lightweight dictionary database with parallelism and scalability. We conducted multi-party HRI experiments for 1,662 subjects in total. In our HRI system, over 60 percent of subjects started speaking to the Actroid and the residence time of their communication also became longer. In addition, we confirmed our system gave humans a more sophisticated impression of the Actroid.

• 14:50~16:10

Journal Session 2

Chair: Mike Goodrich (Brigham Young University)

Controlling Social Dynamics with a Parametrized Model of Floor Regulation (14:50)

Crystal Chao, Andrea L. Thomaz (Georgia Institute of Technology)

Turn-taking is ubiquitous in human communication, yet turn-taking between humans and robots continues to be stilted and awkward for human users. The goal of our work is to build autonomous robot controllers for successfully engaging in human-like turn-taking interactions. Towards this end, we present CADENCE, a novel computational model and architecture that explicitly reasons about the four components of floor regulation: seizing the floor, yielding the floor, holding the floor, and auditing the owner of the floor. The model is parametrized to enable the robot to achieve a range of social dynamics for the human-robot dyad. In a between-groups experiment with 30 participants, our humanoid robot uses this turn-taking system at two contrasting parametrizations to engage users in autonomous object play interactions. Our results from the study show that: (1) manipulating these turn-taking parameters results in significantly different robot behavior; (2) people perceive the robot's behavioral differences and consequently attribute different personalities to the robot; and (3) changing the robot's personality results in different behavior from the human, manipulating the social dynamics of the dyad. We discuss the implications of this work for various contextual applications as well as the key limitations of the system to be addressed in future work.

ACT-R/E: An Embodied Cognitive Architecture for Human-Robot Interaction (15:10)

J. Gregory Trafton, Laura M. Hiatt, Anthony M. Harrison, Franklin P. Tamborello, II, Sangeet S. Khemlani, & Alan C. Schultz
(Naval Research Laboratory)

We present ACT-R/E (Adaptive Character of Thought-Rational / Embodied), a cognitive architecture for human-robot interaction. Our reason for using ACT-R/E is two-fold. First, ACT-R/E enables researchers to build good embodied models of people to understand how and why people think the way they do. Then, we leverage that knowledge of people by using it to predict what a person will do in different situations; e.g., that a person may forget something and may need to be reminded or that a person cannot see everything the robot sees. We also discuss methods of how to evaluate a cognitive architecture and show numerous, empirically validated examples of ACT-R/E models.

A User Study on Kinesthetic Teaching of Redundant Robots in Task and Configuration Space (15:30)

Sebastian Wrede, Christian Emmerich, Ricarda Grünberg, Arne Nordmann, Agnes Swadzba, Jochen Steil (Bielefeld University)

The recent advent of compliant and kinematically redundant robots poses new research challenges for human-robot interaction. While these robots provide a great degree of flexibility for the realization of complex applications, the flexibility gained generates the need for additional modeling steps and definition of criteria for redundancy resolution constraining the robot's movement generation. The explicit modeling of such criteria usually requires experts to adapt the robot's movement generation subsystem. A typical way of dealing with this configuration challenge is to utilize kinesthetic teaching by guiding the robot to implicitly model the specific constraints in task and configuration space. We argue that current programming-by-demonstration approaches are not efficient for kinesthetic teaching of redundant robots and show that typical teach-in procedures are too complex for novice users. In order to enable non-experts to master the configuration and programming of a redundant robot in the presence of non-trivial constraints such as confined spaces, we propose a new interaction scheme combining kinesthetic teaching and learning within an integrated system architecture. We evaluated this approach in a user study with 49 industrial workers at HARTING, a medium-sized manufacturing company. The results show that the interaction concepts implemented on a KUKA Lightweight Robot IV are easy to handle for novice users, demonstrate the feasibility of kinesthetic teaching for implicit constraint modeling in configuration space, and yield significantly improved performance for the teach-in of trajectories in task space.

Crowdsourcing Human-Robot Interaction: New Methods and System Evaluation in a Public Environment (15:50)

Cynthia Breazeal, Nick DePalma, Jeff Orkin (Massachusetts Institute of Technology), Sonia Chernova (Worcester Polytechnic Institute), Malte Jung (Stanford University)

Supporting a wide variety of interaction styles across a diverse set of people is a significant challenge in human-robot interaction (HRI). In this work, we explore a data-driven approach that relies on crowdsourcing as a rich source of interactions that cover a wide repertoire of human behavior. We first develop an online game that requires two players to collaborate to solve a task. One player takes the role of a robot avatar and the other a human avatar, each with a different set of capabilities that must be coordinated to overcome challenges and complete the task. Leveraging the interaction data recorded in the online game, we present a novel technique for data-driven behavior generation using case-based planning for a real robot. We compare the resulting autonomous robot behavior against a Wizard of Oz base case condition in a real-world reproduction of the online game that was conducted at the Boston Museum of Science. Results of a post-study survey of participants indicate that the autonomous robot behavior matched the performance of the human-operated robot in several important measures. We examined video recordings of the real-world game to draw additional insights as to how the novice participants attempted to interact with the robot in a loosely structured collaborative task. We discovered that many of the collaborative interactions were generated in the moment and were driven by interpersonal dynamics, not necessarily by the task design. We explored using bids analysis as a meaningful construct to tap into affective qualities of HRI. An important lesson from this work is that in loosely structured collaborative tasks, robots need to be skillful in handling these in-the-moment interpersonal dynamics, as these dynamics have an important impact on the affective quality of the interaction for people. How such interactions dovetail with more task-oriented policies is an important area for future work, as we anticipate such interactions becoming commonplace in situations where personal robots perform loosely structured tasks in interaction with people in human living spaces.

Wed, 3/6
Miraikan Hall

• 09:00~10:20

Companions, Collaboration, and Control

Chair: Greg Trafton
(Naval Research Laboratory)

Communicating Affect via Flight Path: Exploring Use of the Laban Effort System for Designing Affective Locomotion Paths (09:00)

Megha Sharma, Dale Hildebrandt, Gem Newman, James E. Young, Rasit Eskicioglu (University of Manitoba)

People and animals use various kinds of motion in a multitude of ways to communicate their ideas and affective state, such as their moods or emotions. Further, people attribute affect and personalities to movements of even non-life like entities based solely on the style of their motions, e.g., the locomotion style of a geometric shape (how it moves about) can be interpreted as being shy, aggressive, etc. We investigate how robots can leverage this locomotion-style communication channel for communication with people. Specifically, our work deals with designing stylistic flying-robot locomotion paths for communicating affective state. To author and unpack the parameters of affect-oriented flying-robot locomotion styles we employ the Laban Effort System, a standard method for interpreting human motion commonly used in the performing arts. This paper describes our adaption of the Laban Effort System to author motions for flying robots, and the results of a formal experiment that investigated how various Laban Effort System parameters influence peoples perception of the resulting robotic motions. We summarize with a set of guidelines for aiding designers in using the Laban Effort System to author flying robot motions to elicit desired affective responses.

Legibility and Predictability of Robot Motion (09:20)

Anca D. Dragan (Carnegie Mellon University), **Kenton C.T. Lee** (University of Pennsylvania), **Siddhartha S. Srinivasa** (Carnegie Mellon University)

A key requirement for seamless human-robot collaboration is for the robot to make its intentions clear to its human collaborator. A collaborative robot's motion must be legible, or intent-expressive. Legibility is often described in the literature as and effect of predictable, unsurprising, or expected motion. Our central insight is that predictability and legibility are fundamentally different and often contradictory properties of motion. We develop a formalism to mathematically define and distinguish predictability and legibility of motion. We formalize the two based on inferences between trajectories and goals in opposing directions, drawing the analogy to action interpretation in psychology. We then propose mathematical models for these inferences based on optimizing cost, drawing the analogy to the principle of rational action. Our experiments validate our formalism's prediction that predictability and legibility can contradict, and provide support for our models. Our findings indicate that for robots to seamlessly collaborate with humans, they must change the way they plan their motion.

Taking Your Robot For a Walk: Force-Guiding a Mobile Robot Using Compliant Arms (09:40)

François Ferland, Arnaud Aumont, Dominic Letourneau, François Michaud (Universite de Sherbrooke)

Guiding a mobile robot by the hand would make a simple and natural interface. This requires the ability to sense forces applied on the robot from direct physical contacts, and to translate these forces into motion commands. This paper presents a joint-space impedance control approach that does so by perceiving forces applied on compliant arms, making the robot react as a real-life physical object to a user pulling and pushing on one or both of its arms. By independently controlling stiffness in specific degrees-of-freedom, our approach allows the general position of the arms to change to the preferences of the person interacting with it, a capability that is not possible using a strictly position-based control approach. A test case with 15 volunteers was conducted on IRL-1, an omnidirectional, non-holonomic mobile robot, to study and fine-tune our approach in an unconstrained guiding task, making IRL-1 go in and out of a room through a doorway.

Effects of Robotic Companionship on Music Enjoyment and Agent Perception (10:00)

Guy Hoffman, Keinan Vanunu (IDC Herzliya)

We evaluate the effects of robotic listening companionship on people's enjoyment of music, and on their perception of the robot. We present a robotic speaker device designed for joint listening and embodied performance of the music played on it. The robot generates smoothed real-time beat-synchronized dance moves, uses nonverbal gestures for common ground, and can make and maintain eye-contact. In an experimental between-subject study (n=67), participants listened to songs played on the speaker device, with the robot either moving in sync with the beat, moving off-beat, or not moving at all. We found that while the robot's beat precision was not consciously detected by Ps, an on-beat robot positively affected song liking. There was no effect on overall experience enjoyment. In addition, the robot's response caused Ps to attribute more positive human-like traits to the robot, as well as rate the robot as more similar to themselves. Notably, personal listening habits (solitary vs. social) affected agent attributions. This work points to a larger question, namely how a robot's perceived response to an event might affect a human's perception of the same event.

• 10:40~12:00

Verbal and Non-Verbal Behavior

Chair: Leila Takayama
(Willow Garage)

A Model for Synthesizing a Combined Verbal and NonVerbal Behavior Based on Personality Traits in Human-Robot Interaction (10:40)

Amir Aly, Adriana Tapus (ENSTA-ParisTech)

Robots are more and more present in our daily life; they have to move into human-centered environments, to interact with humans, and to obey some social rules so as to produce an appropriate social behavior in accordance with human's profile (i.e., personality, state of mood, and preferences). Recent researches discussed the effect of personality traits on the verbal and nonverbal production, which plays a major role in transferring and understanding messages in a social interaction between a human and a robot. The characteristics of the generated gestures (e.g., amplitude, direction, rate, and speed) during the nonverbal communication can differ according to the personality trait, which, similarly, influences the verbal content of the human speech in terms of verbosity, repetitions, etc. Therefore, our research tries to map a human's verbal behavior to a corresponding combined robot's verbal-nonverbal behavior based on the personality dimensions of the interacting human. The system estimates first the interacting human's personality traits through a psycholinguistic analysis of the spoken language, then it uses PERSONAGE natural language generator that tries to generate a corresponding verbal language to the estimated personality traits. Gestures are generated by using BEAT toolkit, which performs a linguistic and contextual analysis of the generated language relying on rules derived from extensive research into human conversational behavior. We explored the human-robot personality matching aspect and the differences of the adapted mixed robot's behavior (gesture and speech) over the adapted speech only robot's behavior in an interaction. Our model validated that individuals preferred more to interact with a robot that had the same personality with theirs and that an adapted mixed robot's behavior (gesture and speech) was more engaging and effective than a speech only robot's behavior. Our experiments were done with Nao robot.

Automatic Processing of Irrelevant Co-Speech Gestures with Human but not Robot Actors (11:00)

Cory J. Hayes, Charles R. Crowell, Laurel D . Riek (University of Notre Dame)

Non-verbal, or visual, communication is an important factor of daily human-to-human interaction. Gestures make up one mode of visual communication, where movement of the body is used to convey a message either alone or in conjunction with speech. The purpose of this experiment is to explore how humans perceive gestures made by a humanoid robot compared to the same gestures made by a human. We do this by adapting and replicating a human perceptual experiment by Kelly et al., where a Stroop-like task was used to demonstrate the automatic processing of gesture and speech together. 59 college students participated in our experiment. Our results support the notion that automatic gesture processing occurs when interacting with human actors, but not robot actors. We discuss the implications of these findings for the HRI community.

Rhetorical Robots: Making Robots More Effective Speakers Using Linguistic Cues of Expertise (11:20)

Sean Andrist, Erin Spannan, Bilge Mutlu (University of Wisconsin–Madison)

Robots hold great promise as informational assistants such as museum guides, information booth attendants, concierges, shopkeepers, and more. In such positions, people will expect them to be experts on their area of specialty. Not only will robots need to be experts, but they will also need to communicate their expertise effectively in order to raise trust and compliance with the information that they provide. This paper draws upon literature in psychology and linguistics to examine cues in speech that would help robots not only to provide expert knowledge, but also to deliver this knowledge effectively. To test the effectiveness of these cues, we conducted an experiment in which participants created a plan to tour a fictional city based on suggestions by two robots. We manipulated the landmark descriptions along two dimensions of expertise: practical knowledge and rhetorical ability. We then measured which locations the participants chose to include in the tour based on their descriptions. Our results showed that participants were strongly influenced by both practical knowledge and rhetorical ability; they included more landmarks described using expert linguistic cues than those described using simple facts. Even when the overall level of practical knowledge was high, an increase in rhetorical ability resulted in significant improvements. These results have implications for the development of effective dialogue strategies for informational robots.

Gestures for Industry: Intuitive Human-Robot Communication from Human Observation (11:40)

Brian Gleeson, Karon MacLean, Amir Haddadi, Elizabeth Croft (University of British Columbia), **Javier Alcazar** (General Motors)

Human-robot collaborative work has the potential to advance quality, efficiency and safety in manufacturing. In this paper we present a gestural communication lexicon for human-robot collaboration in industrial assembly tasks and establish methodology for producing such a lexicon. Our user experiments are grounded in a study of industry needs, providing potential real-world applicability to our results. Actions required for industrial assembly tasks are abstracted into three classes: part acquisition, part manipulation, and part operations. We analyzed the communication between human pairs performing these subtasks and derived a set of communication terms and gestures. We found that participant-provided gestures are intuitive and well suited to robotic implementation, but that interpretation is highly dependent on task context. We then implemented these gestures on a robot arm in a human-robot interaction context, and found the gestures to be easily interpreted by observers. We found that observation of human-human interaction can be effective in determining what should be communicated in a given human-robot task, how communication gestures should be executed, and priorities for robotic system implementation based on frequency of use.

• 13:40~15:20

Is The Robot like Me?

Chair: Fumihide Tanaka (Tsukuba Univ.)

Expressing Ethnicity through Behaviors of a Robot Character (13:40)

Maxim Makatchev, Reid Simmons (Carnegie Mellon University), **Majd Sakr, Micheline Ziadee** (CMU Qatar)

Achieving homophily, or association based on similarity, between a human user and a robot holds a promise of improved perception and task performance. However, no previous studies that address homophily via ethnic similarity with robots exist. In this paper, we discuss the difficulties of evoking ethnic cues in a robot, as opposed to a virtual agent, and an approach to overcome those difficulties based on using ethnically salient behaviors. We outline our methodology for selecting and evaluating such behaviors, and culminate with a study that evaluates our hypotheses of the possibility of ethnic attribution of a robot character through verbal and nonverbal behaviors and of achieving the homophily effect.

The Inversion Effect in HRI: Are Robots Perceived More Like Humans or Objects? (14:00)

Jakub Zlotowski, Christoph Bartneck (University of Canterbury)

The inversion effect describes a phenomenon in which certain types of images are harder to recognize when they are presented upside down compared to when they are shown upright. Images of human faces and bodies suffer from the inversion effect whereas images of objects do not. The effect may be caused by the configural processing of faces and body postures, which is dependent on the perception of spatial relations between different parts of the stimuli. We investigated if the inversion effect applies to images of robots in the hope of using it as a measurement tool for robot's anthropomorphism. The results suggest that robots, similarly to humans, are subject to the inversion effect. Furthermore, there is a significant, but weak linear relationship between the recognition accuracy and perceived anthropomorphism. The small variance explained by the inversion effect renders this test inferior to the questionnaire based Godspeed Anthropomorphism Scale.

A Transition Model for Cognitions about Agency (14:20)

Daniel T. Levin, Julie A. Adams, Megan M. Saylor, Gautam Biswas (Vanderbilt University)

Recent research in a range of fields has explored people's concepts about agency, and this issue is clearly important for understanding the conceptual basis of human-robot interaction. This research takes a wide range of approaches, but no systematic model of reasoning about agency has combined the concepts and processes involved agency-reasoning comprehensively enough to support research exploring issues such as conceptual change in reasoning about agents, and the interaction between concepts about agents and visual attention. Our goal in this paper is to develop a transition model of reasoning about agency that achieves three important goals. First, we aim to specify the different kinds of knowledge that is likely to be accessed when people reason about agents. Second, we specify the circumstances under which these different kinds of knowledge might be accessed and be changed. Finally, we discuss how this knowledge might affect basic psychological processes of attention and memory. Our approach will be to first describe the transition model, then to discuss how it might be applied in two specific domains: computer interfaces that allow a single operator to track multiple robots, and a teachable agent system currently in use assisting primary and middle school students in learning natural science concepts.

Presentation of (Telepresent) Self: On the Double-Edged Effects of Mirrors (14:40)

Leila Takayama (Willow Garage), **Helen Harris** (Stanford University)

Mobile remote presence systems present new opportunities and challenges for physically distributed people to meet and work together. One of the challenges observed from a couple of years of using Texai, a mobile remote presence (MRP) system, is that remote operators are often unaware of how they present themselves through the MRP. Problems arise when remote operators are not clearly visible through the MRP video display; this mistake makes the MRP operators look like anonymous intruders into the local space rather than approachable colleagues. To address this problem, this study explores the effects of visual feedback for remote teleoperators, using a controlled experiment in which mirrors were either present or absent in the local room with the MRP system (N=24). Participants engaged in a warm-up remote communication task followed by a remote driving task. Compared to mirrors-absent participants, mirrors-present participants were more visible on the MRP screens and practiced navigating longer. However, the mirrors-present participants also reported experiencing more frustration and having less fun. Implications for theory and design are discussed.

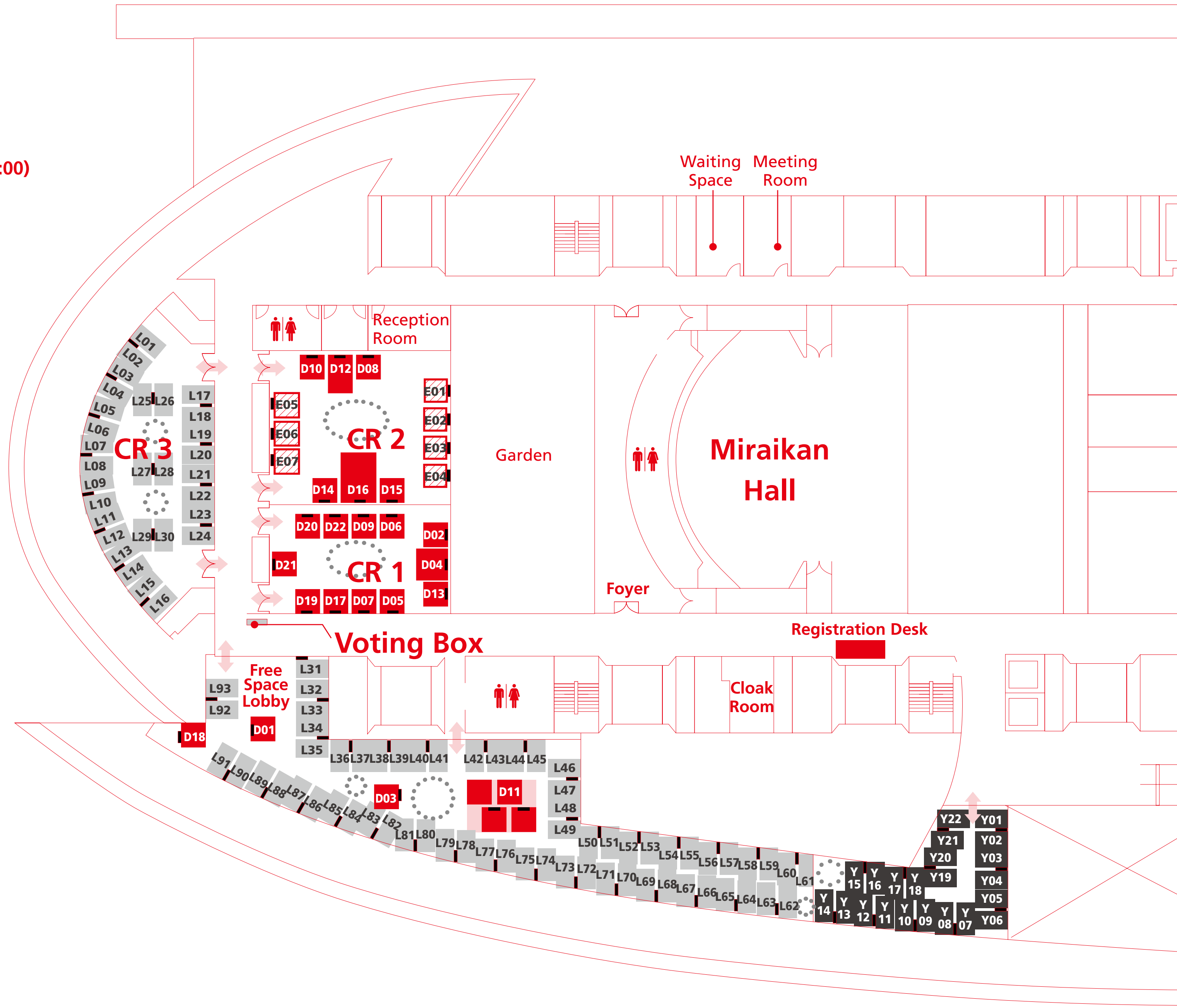
Are You Looking At Me?: Perception of Robot Attention is Mediated by Gaze Duration and Group Size (15:00)

Henny Admoni, Bradley Hayes, David Feil-Seifer, Daniel Ullman, Brian Scassellati (Yale University)

Studies in HRI have shown that people follow and understand robot gaze. However, only a few studies to date have examined the time-course of a meaningful robot gaze, and none have directly investigated what type of gaze is best for eliciting the perception of attention. This paper investigates two types of gaze behaviors---short, frequent glances and long, less frequent stares---to find which behavior is better at conveying a robot's visual attention. We describe the development of a programmable research platform from MyKeepon toys, and the use of these programmable robots to examine the effects of gaze type and group size on the perception of attention. In our experiment, participants viewed a group of MyKeepon robots executing random motions, occasionally fixating on various points in the room or directly on the participant. We varied type of gaze fixations within participants and group size between participants. Results show that people are more accurate at recognizing shorter, more frequent fixations than longer, less frequent ones, and that their performance improves as group size decreases. From these results, we conclude that multiple short gazes are preferable for indicating attention over one long gaze, and that the visual search for robot attention is susceptible to group size effects.

Map - Demo & Poster

Demo Session : 3/4 (16:30~18:00)
Late Breaking Reports and Poster Session : 3/4 (18:00~20:00)
Human-Robot Interaction Pioneers Workshop : 3/4 (18:00~20:00)
Exhibition : 3/3~3/6



LBR Poster

Demo

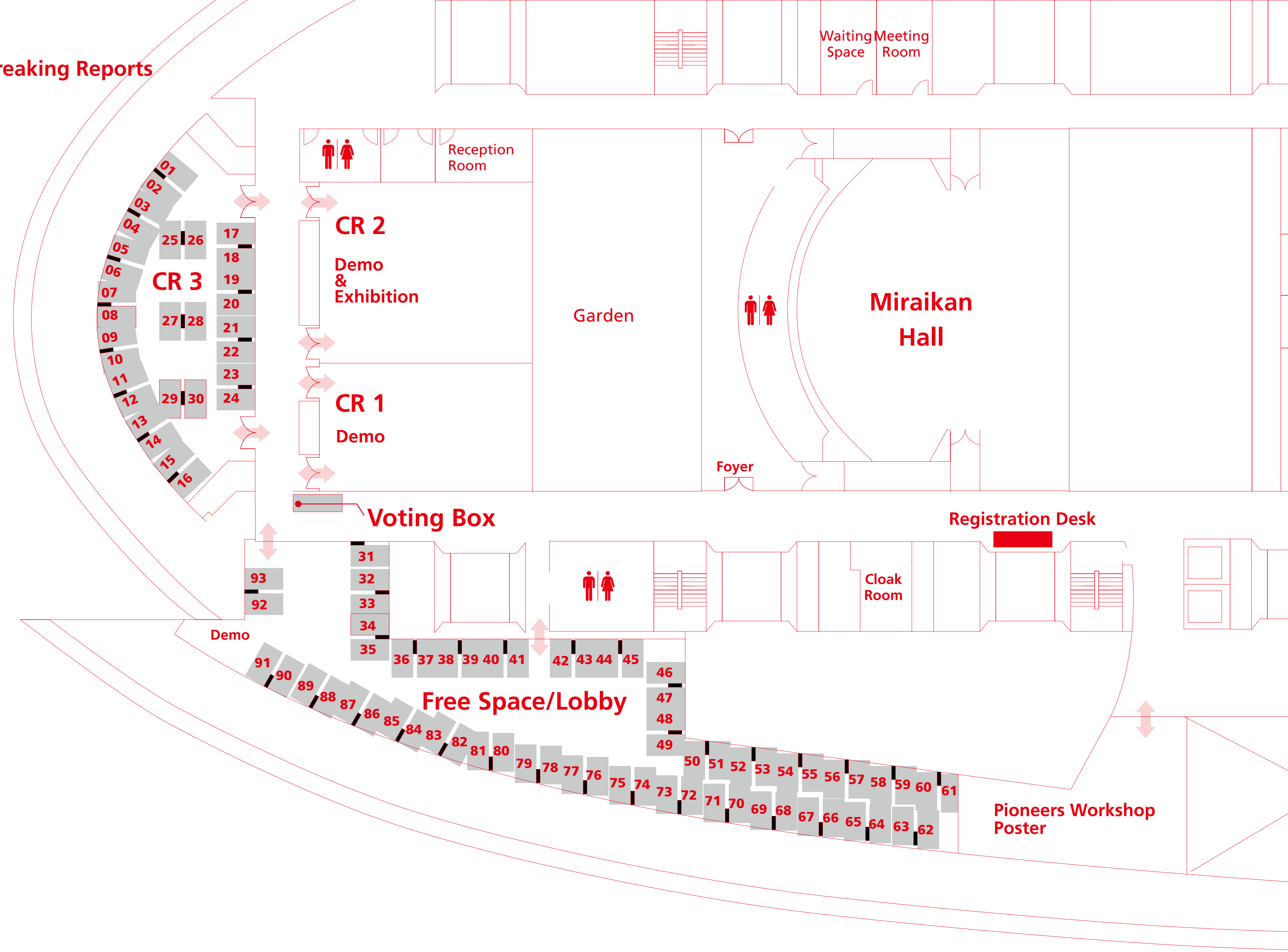
Exhibition

Pioneers Workshop Poster

Food

Map - Late-Breaking Reports

Mon, 3/4 (18:00~20:00)
CR3/Free Space/Lobby



LBR Poster

Late-Breaking Reports

Mon, 3/4 (18:00~20:00)
CR3/Free Space/Lobby

01. Experiencing the Familiar, Understanding the Interaction and Responding to a Robot Proactive Partner
Gentiane Venture (Tokyo University of Agriculture and Technology), Ritta Baddoura (Universite de Montpellier), Tianxiang Zhang (Tokyo University of Agriculture and Technology)

02. The Affect of Collaboratively Programming Robots in a 3D Virtual Simulation
Michael Vallance (Future University Hakodate)

03. ASAHI: OK for Failure
Yutaka Hiroi (Osaka Institute of Technology), Akinori Ito (Tohoku University)

04. The Vernissage Corpus:
A Conversational Human-Robot-Interaction Dataset
Dinesh Babu Jayagopi (Idiap Research Institute), Samira Sheiki (Idiap Research Institute and EPFL), David Klotz, Johannes Wienke (Bielefeld University), Jean-Marc Odobez (Idiap Research Institute and EPFL), Sebastien Wrede (Bielefeld University), Vasil Khalidov, Laurent Nyugen (Idiap Research Institute), Britta Wrede (Bielefeld University), Daniel Gatica-Perez (Idiap Research Institute and EPFL)

05. The Effects of Familiarity and Robot Gesture on User Acceptance of Information
Aelee Kim (Sungkyunkwan University), Younbo Jung (Nanyang Technological University), Kwanmin Lee (University of Southern California), Jooyun Han (Sungkyunkwan University)

06. Balance-Arm Tablet Computer Stand for Robotic Camera Control
Peter Turpel, Bing Xia, Xinyi Ge, Shuda Mo, Steve Vozar (University of Michigan)

07. Embedded Multimodal Nonverbal and Verbal Interactions between a Mobile Toy Robot and Autistic Children
Irini Giannopulu (UCP & UPMC)

08. Recognition for Psychological Boundary of Robot
Chyon Hae Kim (Honda Research Institute Japan), Yumiko Yamazaki, Shunsuke Nagahama, Shigeki Sugano (Waseda University)

09. Interaction with an Agent in Blended Reality
Yusuke Kanai, Hirotaka Osawa, MIchita Imai (Keio University)

10. Movement Synchronization Fails during Non-Adaptive Human-Robot Interaction
Tamara Lorenz (Ludwig-Maximilians Universität), Alexander Mörtl, Sandra Hirche (Technische Universität München)

11. Design of Robot Eyes Suitable for Gaze Communication
Tomomi Onuki, Takafumi Ishinoda (Saitama University), Yoshinori Kobayashi (Saitama University, JST PRESTO), Yoshinori Kuno (Saitama University)

12. Ultra-fast Multimodal and Online Transfer Learning on Humanoid Robots
Daiki Kimura, Ryutaro Nishimura, Akihiro Oguro, Osamu Hasegawa (Tokyo Institute of Technology)

13. Individually Specialized Feedback Interface for Assistance Robots in Standing-up Motion
Asuka Takai, Chihiro Nakagawa, Atsuhiko Shintani, Tomohiro Ito (Osaka Prefecture University)

14. Gamification of a Recycle Bin with Emoticons
Jose Berengueres, Fatma Alsuwairi (United Arab Emirates University), Nazar Zaki, Salama Al Helli (College of Information Technology), Tony Ng (United Arab Emirates University)

15. Legible User Input for Intent Prediction
Kenton C. T. Lee (University of Pennsylvania), Anca D. Dragan, Siddhartha S. Srinivasa (Carnegie Mellon University)

16. Development of a Glove-Based Optical Fiber Sensor for Applications in Human-Robot Interaction
Eric Fujiwara, Danilo Yugo Miyatake, Murilo Ferreira Marques Santos, Carlos Kenichi Suzuki (State University of Campinas)

17. Unified Environment-Adaptive Control of Accompanying Robots Using Artificial Potential Field
Kazushi Nakazawa, Keita Takahashi, Masahide Kaneko (The University of Electro-Communications)

18. Directly or on Detours? How Should Industrial Robots Approximate Humans?
Dino Bortot, Maximilian Born, Klaus Bengler (Technische Universität München)

19. Enabling Clinicians to Rapidly Animate Robots
John Alan Atherton, Michael A Goodrich (Brigham Young University)

20. Be a Robot! Robot Navigation Patterns in a Path Crossing Scenario
Christina Lichtenthaeler (Technische Universität München), Annika Peters (Bielefeld University), Sascha Griffiths (Technische Universität München), Alexandra Kirsch (Tübingen University)

21. Perceptions of Affective Expression in a Minimalist Robotic Face
Casey C Bennett, Selma `abanovi (Indiana University)

22. Improving Teleoperated Robot Speed Using Optimization Techniques
Steve Vozar, Dawn Tilbury (University of Michigan)

23. Have You Ever Lied?: The Impacts of Gaze Avoidance on People's Perception of a Robot
Jung Ju Choi (Ewha Womans University), Yunkyung Kim (KAIST), Sonya S. Kwak (Ewha Womans University)

24. Measurement of Rapport-Expectation with a Robot
Tatsuya Nomura (Ryukoku University), Takayuki Kanda (ATR Intelligent Robotics and Communication Laboratories)

25. Directing Robot Motions with Paralinguistic Information
Takanori Komatsu, Yuuki Seki (Shinshu University)

26. Quadrotor or Blimp? Noise and Appearance Considerations in Designing Social Aerial Robot
Chun Fui Liew, Takehisa Yairi (The University of Tokyo)

27. The Impacts of Intergroup Relations and Body Zones on People's Acceptance of a Robot
Jung Ju Choi (Ewha Womans University), Yunkyung Kim (KAIST), Sonya S. Kwak (Ewha Womans University)

28. Perception during Interaction is Not Based on Statistical Context
Alessandra Sciutti, Andrea Del Prete, Lorenzo Natale (Istituto Italiano di Tecnologia), David Burr (Università degli Studi di Firenze), Giulio Sandini, Monica Gori (Istituto Italiano di Tecnologia)

29. Given that, Should I Respond? Contextual Addressee Estimation in Multi-Party Human-Robot Interactions
Dinesh Babu Jayagopi (Idiap Research Institute), Jean-Marc Odobez (Idiap Research Institute and EPFL)

30. Interactive Display Robot: Projector Robot with Natural User Interface
Sun-Wook Choi, Woong-Ji Kim, Chong Ho Lee (INHA University)

31. Robot Confidence and Trust Alignment

Poornima Kaniarasu, Aaron Steinfeld (Carnegie Mellon University), Munjal Desai, Holly Yanco (University of Massachusetts Lowell)

32. Integration of Work Sequence and Embodied Interaction for Collaborative Work Based Human-Robot Interaction

Jeffrey Too Chuan Tan, Tetsunari Inamura (National Institute of Informatics)

33. Providing Tablets as Collaborative-Task Workspace for Human-Robot Interaction

Hae Won Park, Ayanna Howard (Georgia Institute of Technology)

34. Influence of Robot-Issued Joint Attention Cues on Gaze and Preference

Sonja Caraian, Nathan Kirchner (University of Technology, Sydney)

35. Input Modality and Task Complexity: Do they Relate?

Gerald Stollnberger, Astrid Weiss, Manfred Tscheligi (CDL on Contextual Interfaces)

36. Neural Correlates of Empathy Towards Robots

Astrid Marieke Rosenthal-von der Pütten (University of Duisburg-Essen), Frank P. Schulte, Sabrina C Eimler, Laura Hoffmann, Sabrina Sobieraj, Stefan Maderwald, Nicole C Krämer, Matthias Brand (University of Duisburg-Essen)

37. Tell Me Your Story, Robot

Martina Mara (Ars Electronica Futurelab), Markus Appel (Johannes Kepler University of Linz), Hideaki Ogawa, Christopher Lindinger, Emiko Ogawa (Ars Electronica Futurelab), Hiroshi Ishiguro, Kohei Ogawa (Osaka University)

38. Integrating a Robot in a Tabletop Reservoir Engineering Application

Sowmya Somanath, Ehud Sharlin, Mario Costa Sousa (University of Calgary)

39. Adopt-a-Robot: A Story of Attachment

Damith C. Herath, Christian Kroos, Catherine Stevens, Denis Burnham (MARCS Institute)

40. Personal Service: A Robot that Greets People Individually Based on Observed Behavior Patterns

Dylan F Glas, Kanae Wada (ATR & Osaka University), Masahiro Shiomi, Takayuki Kanda (ATR), Hiroshi Ishiguro (ATR & Osaka University), Norihiro Hagita (ATR)

41. A Study of Effective Social Cues within Ubiquitous Robotics

Anara Sandygulova, David Swords, Sameh Abdel-Naby, G.M.P. O'Hare, Mauro Dragone (University College Dublin)

42. Designing Robotic Avatars

Angie Lorena Marin Mejia, Doori Jo, Sukhan Lee (Sungkyunkwan University)

43. Eliciting Ideal Tutor Trait Perception in Robots

Jonathan S Herberg, Dev C Behera, Martin Saerbeck (Institute of High Performance Computing)

44. Potential Use of Robots in Taiwanese Nursing Homes

Wan-Ling Chang, Selma `abanovi (Indiana University)

45. Elementary Science Lesson Delivered by Robot

Takuya Hashimoto, Hiroshi Kobayashi (Tokyo University of Science), Alex Polishuk, Igor Verner (Technion)

46. Question Strategy and Interculturality in Human-Robot Interaction

Mihoko Fukushima, Rio Fujita, Miyuki Kurihara, Tomoyuki Suzuki, Keiichi Yamazaki (Saitama University), Akiko Yamazaki (Tokyo University of Technology), Keiko Ikeda (Kansai University), Yoshinori Kuno, Yoshinori Kobayashi, Takaya Ohyama, Eri Yoshida (Saitama University)

47. Robots that Can Feel the Mood

Akira Imayoshi, Nagisa Munekata, Tetsuo Ono (Hokkaido University)

48. Swimoid: Interacting with an Underwater Buddy Robot

Yu Ukai (The University of Tokyo), Jun Rekimoto (The University of Tokyo / Sony CSL)

49. The Influence of Robot Appearance on Assessment

Kerstin Sophie Haring, Katsumi Watanabe (The University of Tokyo), Celine Mougenot (Tokyo Institute of Technology)

50. Development of RoboCup @Home Simulator

Tetsunari Inamura, Jeffrey Too Chuan TAN (National Institute of Informatics)

51. A Spatial Augmented Reality System for Intuitive Display of Robotic Data

Florian Leutert, Christian Herrmann, Klaus Schilling (Julius-Maximilians-Universität Würzburg)

52. Personalized Robotic Service using N-gram Affective Event model

Gi Hyun Lim (Technische Universität München), Seung Woo Hong, Inhee Lee, Il Hong Suh (Hanyang University), Michael Beetz (University of Bremen)

53. Attention Control System Considering the Target Person's Attention Level

Dipankar Das, Mohammed Moshiul Hoque (Saitama University), Yoshinori Kobayashi (Saitama University & JST PRESTO), Yoshinori Kuno (Saitama University)

54. Loneliness Makes The Heart Grow Fonder (Of Robots)

Friederike Eyssel (Bielefeld University), Natalia Reich (Technical University of Dortmund)

55. Robot Embodiment, Operator Modality, and Social Interaction in Tele-Existence

Christian Becker-Asano, Severin Gustorff, Kai Oliver Arras (Albert-Ludwigs-Universität Freiburg), Kohei Ogawa (Osaka University), Shuichi Nishio (Advanced Telecommunications Research Institute Intl.), Hiroshi Ishiguro (Osaka University)

56. Towards Empathic Artificial Tutors

Amol Deshmukh (Heriot-Watt University), Ginevra Castellano (University of Birmingham), Arvid Kappas (Jacobs University Bremen), Wolmet Barendregt (University of Gothenburg), Fernando Nabais (YDreams Robotics S.A), Ana Paiva, Tiago Ribeiro, Iolanda Leite (GAIPS, INESC-ID and Instituto Superior Tecnico), Ruth Aylett (Heriot-Watt University)

57. 3D Auto-Calibration Method for Head-Mounted Binocular Gaze Tracker as Human-Robot Interface

Su Hyun Kwon, Min Young Kim (Kyungpook National University)

58. Empathy between Human and Robot?

Doori Jo, Jooyun Han, Kyungmi Chung, Sukhan Lee (Sungkyunkwan University)

59. Single Assembly Robot in Search of Human Partner

Ross A. Knepper, Stefanie Tellex (Massachusetts Institute of Technology), Adrian Li (University of Cambridge), Nicholas Roy, Daniela Rus (Massachusetts Institute of Technology)

60. iProgram: Intuitive Programming of an Industrial HRI Cell

Jürgen Blume, Alexander Bannat, Gerhard Rigoll (Technische Universität München)

61. Robot-Human Hand-Overs in Non-Anthropomorphic Robots

Prasanna Kumar Sivakumar, Chittaranjan S Srinivas (SASTRA University), Andrey Kiselev, Amy Loutfi (Orebro University)

62. Emergence of Turn-taking in Unstructured Child-Robot Social Interactions

Paul Baxter (Plymouth University), **Rachel Wood** (University of Malta), **Ilaria Baroni** (Fondazione Centro San Raffaele), **James Kennedy** (Plymouth University), **Marco Nalin** (Fondazione Centro San Raffaele), **Tony Belpaeme** (Plymouth University)

63. Human-Agent Teaming for Robot Management in Multitasking Environments

Jessie Y.C. Chen, Stephanie Quinn, Julia Wright (U.S. Army Research Laboratory), **Daniel Barber, David Adams** (University of Central Florida), **Michael Barnes** (U.S. Army Research Laboratory)

64. The Role of Emotional Congruence in Human-Robot Interaction

Karoline Malchus, Petra Jaecks, Oliver Damm, Prisca Stenneken, Carolin Meyer, Britta Wrede (Bielefeld University)

65. Goal Inferences about Robot Behavior

Hedwig Anna Theresia Broers, Jaap Ham, Ron Broeders (Eindhoven University of Technology), **P. Ravindra de Silva, Michio Okada** (Toyohashi University of Technology)

66. Using the AffectButton to Measure Affect in Child and Adult-Robot Interaction

Robin Read, Tony Belpaeme (Plymouth University)

67. People Interpret Robotic Non-Linguistic Utterances Categorically

Robin Read, Tony Belpaeme (Plymouth University)

68. Is That Me? Sensorimotor Learning and Self-Other Distinction in Robotics

Guido Schillaci, Verena Vanessa Hafner (Humboldt-Universität zu Berlin), **Bruno Lara** (Universidad Autónoma del Estado de Morelos), **Marc Grosjean** (Leibniz Research Centre for Working Environment and Human Factors)

69. Survey of Metrics for Human-Robot Interaction

Robin Murphy (Texas A&M University), **Debra Schreckenghost** (TRACLabs, Inc.)

70. Designing for Sociality in HRI by Means of Multiple Personas in Robots

Jolina H. Ruckert, Peter H. Kahn Jr. (University of Washington), **Takayuki Kanda** (ATR), **Hiroshi Ishiguro** (ATR & Osaka University), **Solace Shen, Heather E. Gary** (University of Washington)

71. What Happens When a Robot Favors Someone?

Daphne E. Karreman, Gilberto U. Sepúlveda Bradford, Betsy E.M.A.G. van Dijk, Manja Lohse, Vanessa Evers (University of Twente)

72. Anthropomorphism in the Factory - A Paradigm Change?

Susanne Stadler, Astrid Weiss, Nicole Mirnig, Manfred Tscheligi (University of Salzburg)

73. Position-Invariant, Real-Time Gesture Recognition Based on Dynamic Time Warping

Saaa Bodiro~a (Humboldt-Universität zu Berlin), **Guillaume Doisy** (Ben-Gurion University of the Negev), **Verena Vanessa Hafner** (Humboldt-Universität zu Berlin)

74. Generating Finely Synchronized Gesture and Speech for Humanoid Robots: A Closed-Loop Approach

Maha Salem, Stefan Kopp (Bielefeld University), **Frank Joublin** (Honda Research Institute Europe)

75. The NAO Models for the Elderly

David López Recio (Mobile Life @ KTH), **Elena Márquez Segura** (Mobile Life @ SICS), **Luis Márquez Segura** (Fonserrana S.C.A de interés social), **Annika Waern** (Mobile Life @ Stockholm University)

76. A Robotic Therapy for Children with TBI

Alex Barco, Jordi Albo-Canals, Miguel Kaouk Ng, Carles Garriga (LIFAELS La Salle), **Laura Callejón, Marc Turón, Claudia Gómez, Anna López-Sala** (Servei de Neurologia - Hospital Sant Joan de Déu (HSJD))

77. Where to Look and Who to Be

Lorin D Dole, David M Sirkin, Rebecca M Currano (Stanford University), **Robin R Murphy** (Texas A&M University), **Clifford I Nass** (Stanford University)

78. BioSleeve: a Natural EMG-Based Interface for HRI

Christopher Assad, Michael Wolf (Jet Propulsion Laboratory, California Institute of Technology), **Theodoros Theodoridis** (University of Essex), **Kyrre Glette** (University of Oslo), **Adrian Stoica** (Jet Propulsion Laboratory, California Institute of Technology)

79. Execution Memory for Grounding and Coordination

Stephanie Rosenthal, Sarjoun Skaff (Bossa Nova Robotics), **Manuela Veloso** (Carnegie Mellon University), **Dan Bohus, Eric Horvitz** (Microsoft Research)

80. Spatially Unconstrained, Gesture-Based Human-Robot Interaction

Guillaume Doisy (Ben-Gurion University of the Negev), **Aleksandar Jevtic** (Robosoft), **Saaa Bodiroza** (Humboldt-Universität zu Berlin)

81. A Wearable Visuo-Inertial Interface for Humanoid Robot Control

Junichi Sugiyama, Jun Miura (Toyohashi University of Technology)

82. Listening to vs Overhearing Robots in a Hotel Public Space

Yadong Pan, Haruka Okada, Toshiaki Uchiyama, Kenji Suzuki (University of Tsukuba)

83. Using Human Approach Paths to Improve Social Navigation

Eleanor Avrunin, Reid Simmons (Carnegie Mellon University)

84. Learning from the Web: Recognition Method Based on Object Appearance from Internet Images

Enrique Hidalgo-Peña, Luis Felipe Marin-Urias, Fernando Montes-González, Antonio Marín-Hernández, Homero Vladimir Ríos-Figueroa (Universidad Veracruzana)

85. Towards a Comprehensive Chore List for Domestic Robots

Maya Cakmak, Leila Takayama (Willow Garage, Inc.)

86. Human Pointing as a Robot Directive

Syed Shaukat Raza Abidi, MaryAnne Williams, Benjamin Johnston (University of Technology, Sydney)

87. LMA based Emotional Motion Representation using RGB-D Camera

Woo Hyun Kim, Jeong Woo Park, Won Hyong Lee (Korea Advanced Institute of Science and Technology), **Hui Sung Lee** (Hyundai-KIA MOTORS), **Myung Jin Chung** (Korea Advanced Institute of Science and Technology)

88. Effects of Robot Capability on User Acceptance

Elizabeth Cha, Anca D Dragan, Siddhartha S Srinivasa (Carnegie Mellon University)

89. Interactive Facial Robot System on a Smart Device

Won Hyong Lee, Jeong Woo Park, Woo Hyun Kim, Myung Jin Chung (Korea Advanced Institute of Science and Technology)

90. Use of Seal-like Robot PARO in Sensory Group Therapy for Older Adults with Dementia

Wan-Ling Chang, Selma `abanovi, Lesa Huber (Indiana University)

91. Developing Therapeutic Robot for Children with Autism: A Study on Exploring Colour Feedback

Jaeryoung Lee, Goro Obinata (Nagoya University)

Video Session

Wed, 3/6 (15:40~16:40)
7F Miraikan Hall

Natural Interaction for Object Hand-Over

Mamoun Gharbi, Séverin Lemaignan, Jim Mainprice, Rachid Alami
(CNRS, LAAS, Univ de Toulouse)

The video presents in a didactic way several abilities and algorithms required to achieve interactive "pick and give" tasks in a human environment. Communication between the human and the robot relies on unconstrained verbal dialogue, the robot uses multi-modal perception to track the human and its environment, and implements real-time 3D motion planning algorithms to achieve collision-free and human-aware interactive manipulation.

The Oriboos Going to Nepal

Elena Márquez Segura (Mobile Life @ SICS), **Jin Moen** (Movinto Fun), **Annika Waern** (Mobile Life @ Stockholm University), **Adrián Onco Orduna** (None)

A Story of Playful Encounters.
We created a fictional story about a bunch of interactive robot toys, the Oriboos, which travel to different schools where children interact and play with them. The story is based on two workshops done in Sweden and Nepal.

Emo-bin: How to Recycle more by using Emoticons

Jose Berengueres, Fatma Alsuwari, Nazar Zaki, Salama Alhilli (UAE University), **Tony Ng** (College of Information Technology)

In UAE only 10% of PET bottles are recycled. We introduce an emoticon-bin, a recycle bin that rewards users with smiles and sounds. When a user recycles the bin smiles. We show that by exploiting human responsiveness to emoticons, recycling rates increase by a factor of x3.

I Sing the Body Electric

Jakub Zlotowski, Timo Bleeker, Christoph Bartneck, Ryan Reynolds
(University of Canterbury)

An Experimental Theatre Play with Robots

New Clay for Digital Natives' HRI: Create Your Own Interactions with SiCi

Jae-Hyun Kim, Jae-Hoon Jung, Jin-Sung Kim, Yong-Gyu Jin, Jung-Yun Sung, Se-Min Oh, Jae-Sung Ryu, Hyo-Yong Kim (Hansung University), **Soo-Hee Han** (Konkuk University), **Hye-Kyung Cho** (Hansung University)

This work-in-progress video introduces SiCi (smart ideas for creative interplay), an authoring tool to create new type of robot contents by combining interactions among multimedia entities in the virtual world with robots in the real world.

LSInvaders

Anna Fusté, Judith Amores, Sergi Perdices, Santi Ortega, David Miralles
(La Salle - Universitat Ramon Llull)

Cross reality environment inspired by the arcade game Space Invaders.
LSInvaders was born from the willingness to explore the collaboration between human and robots. We have developed a project with the aim of unifying different types of interactions in a cooperative environment. The project is inspired by the arcade game Space Invaders. The difference between Space Invaders and LSInvaders is that the user receives the help of a physical robot with artificial intelligence to get over the level. Although the system itself is a basic game, and it seems like it would make no difference whether the robot is embodied or a typical AI virtual agent its participation as a real element improves the gameplay.

Swimoid: Interacting with an Underwater Buddy Robot

Yu Ukai (The University of Tokyo),
Jun Rekimoto (The University of Tokyo / Sony CSL)

The methodology of presenting information from robots to humans in underwater environments has become an important topic because of the rapid technological advancement in the field of the underwater vehicles and the underwater applications. However, this topic has not yet been fully investigated in the research field of Underwater Human-Robot Interaction(UHRI). We propose a new concept of an underwater robot called the ``Buddy Robot". And we define the term ``Buddy Robot" as a category of the underwater robot that has the two abilities; recognizing and following the user and giving out visual information to human using display devices. As one specific example of the concept, we develop a swim support system called ``Swimoid". Swimoid consists of three parts, a hardware , a control software and functions that can support swimmers in three ways; self-awareness, coaching and game. Self-awareness function enables swimmers to recognize themselves swimming form in real time. Coaching function enables coaches on the poolside to give instructions to swimmers by drawing some shapes. Game function helps novice swimmers to get familiar with water in a fun way. As a result of user tests, we confirmed this system works properly by the test user's comments.'

iRIS: A Remote Surrogate for Mutual Reference

Hiroaki Kawanobe, Yoshifumi Aosaki, Hideaki Kuzuoka (University of Tsukuba), **Yusuke Suzuki** (Oki Electric Industry Co., Ltd.)

In this video, we introduce iRIS, a remote surrogate robot that facilitates mutual reference to a physical object over the distance. The robot has a display that shows remote participants head. The display is mounted on a 3-DOF neck. The robot also has a built-in projector enabling a remote participant to show his/her actual hand gestures through a physical object in the local environment.

Robot George - Interactive Continuous Learning of Visual Concepts

Michael Zillich, Kai Zhou (Vienna University of Technology), **Danijel Skocaj, Matej Kristan, Alen Vrecko** (University of Ljubljana), **Miroslav Janicek, Geert-Jan M. Kruijff** (DFKI), **Thomas Keller** (Albert-Ludwigs-Univ.), **Marc Hanheide, Nick Hawes** (University of Birmingham), **Marko Mahnic** (University of Ljubljana)

The video presents the robot George learning visual concepts in dialogue with a tutor.

Talking to my Robot: From Knowledge Grounding to Dialogue Processing

Séverin Lemaignan, Rachid Alami
(CNRS, LAAS, Univ de Toulouse)

The video presents in a didactic way the tools developed at LAAS-CNRS and related to symbol grounding and natural language processing for companion robots. It mainly focuses on two of them: the ORO-server knowledge base and the Dialogs natural language processor. These two tools enable three cognitive functions that allow for better natural interaction between humans and robots: a 'theory of mind' built upon 'perspective taking', 'multi-modal' communication, that combines verbal input with gestures, and a limited 'symbol grounding' capability with a disambiguation mechanism supported by the two first cognitive abilities.

Talking-Ally: Towards Persuasive Communication

Yuki Odahara, Youhei Kurata, Naoki Ohshima, P. Ravindra S De Silva, Michio Okada (Toyohashi University of Technology)

We develop a social robot (Talking-Ally) which is capable of liking the state of the person (addressee) through an utterance generation mechanism (addressivity) that refers to the hearer's resources (hearership) in order to persuade the user through dynamic interactions.

A Dog Tail for Communicating Robotic States

Ashish Singh, James E. Young
(University of Manitoba)

We present a dog-tail interface for communicating abstract affective robotic states. We believe that people have a passing knowledge to understand basic dog tail language (e.g., tail wagging means happy). This knowledge can be leveraged to understand affective states of a robot. For example, by appearing energetic, it can suggest that it has a full battery and does not need charging. To investigate this, we built a robotic tail interface to communicate affective states of a robot. We conducted an exploratory user study to explore how low-level tail parameters such as speed influence people's perceptions of affect. In this paper, we briefly describe our study design and the results obtained.

CULOT: Sociable Creature for Child's Playground

Nozomi Kina, Daiki Tanaka, Naoki Ohshima, P. Ravindra S De Silva, Michio Okada
(Toyohashi University of Technology)

The video shows that CULOT as a sociable robot and playground character to establish play routing with children to develop playground language through inarticulate sounds by synchronizing its moving behaviors and body gestures.

A Model of Handing Interaction Towards a Pedestrian

Chao Shi, Masahiro Shiomi (ATR), **Christian Smith** (Royal Institute of Technology), **Takayuki Kanda** (ATR), **Hiroshi Ishiguro** (Osaka University)

This video reports our research on developing a model for a robot handing flyers to pedestrians. The difficulty is that potential receivers are pedestrians who are not necessarily cooperative; thus, the robot needs to appropriately plan its motion making it is easy and non-obstructive for potential receivers to receive the flyers. In order to establish a model, we analyzed human interaction, and found that (1) a giver approaches a pedestrian from frontal right/left but not frontal center, and (2) he simultaneously stops his walking motion and arm-extending motion at the moment when he hands out the flyer. Using these findings, we established a model for a robot to perform natural proactive handing. The proposed model is implemented in a humanoid robot and is confirmed as effective in a field experiment.

Coaching Robots with Biosignals based on Human Affective Social Behaviors

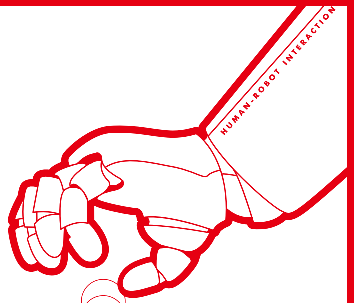
Kenji Suzuki, Anna Gruebler, Vincent Berenz
(University of Tsukuba)

We introduce a novel paradigm of social interaction between humans and robots, which is a style of coaching humanoid robots through interaction with a human instructor, who provides reinforcement via affective/social behaviors and biological signals. In particular facial Electromyography (EMG) to capture affective human response by using a personal wearable device is used as guidance or feedback to shape robot behavior. Through real-time pattern classification, facial expressions can be identified from them and interpreted as positive and negative responses from a human. We also developed a behavior-based architecture for testing this approach in the context of complex reactive robot behaviors.

Interactive Object Modeling & Labeling for Service Robots

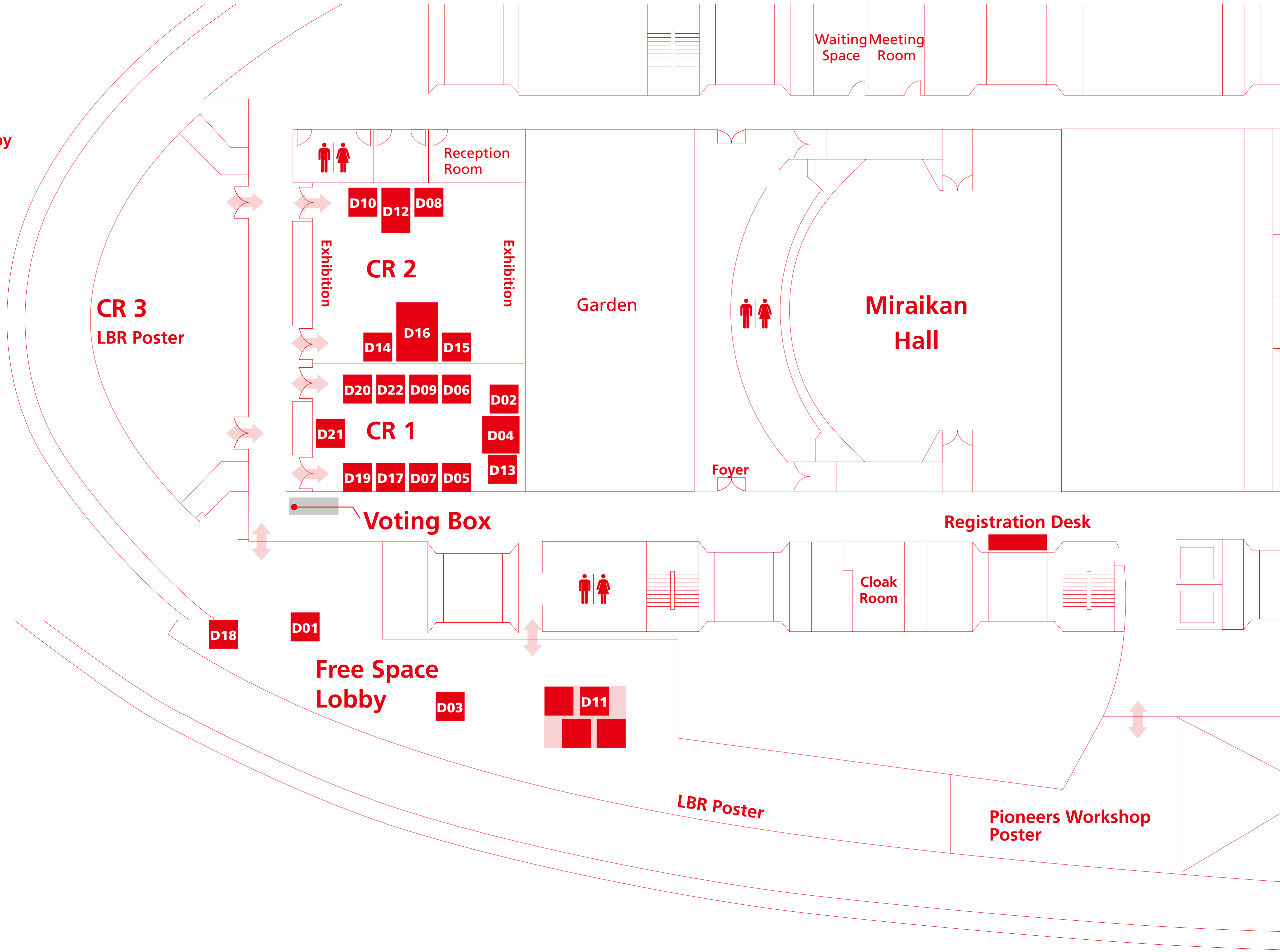
Alexander J. B. Trevor, John G. Rogers III, Akansel Cosgun, Henrik I. Christensen
(Georgia Institute of Technology)

We present an interactive object modeling and labeling system for service robots. The system enables a user to interactively create object models for a set of objects. Users also provide a label for each object, allowing it to be referenced later. Interaction with the robot occurs via a combination of a smartphone UI and pointing gestures.



Map - Demo

Mon, 3/4 (16:30~18:00)
CR1/CR2/Free Space/Lobby



Demo

Demo Session

Mon, 3/4 (16:30~18:00)
CR1/CR2/Free Space/Lobby

D01. Robotic Wheelchair Moving Alongside a Companion

Ryota Suzuki, Yoshihisa Sato, Yoshinori Kobayashi, Yoshinori Kuno, Keiichi Yamazaki (Saitama University), Masaya Arai, Akiko Yamazaki (Tokyo University of Technology)

D02. Strengthening Social Telepresence and Social Bonding by a Remote Handshake

Yuya Wada, Kazuaki Tanaka, Hideyuki Nakanishi (Osaka University)

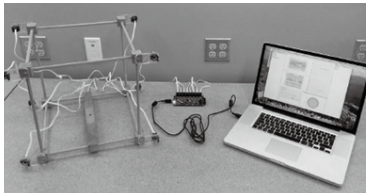
D03. TEROOS: A Wearable Avatar to Enhance Joint Activities

Tadakazu Kashiwabara, Tatsuki Ohnishi, Hirotaka Osawa (Keio University), Kazuhiko Shinozawa (ATR), Michita Imai (Keio University)

D04. Why Do the People Interact with the Shadow Circles?

Takafumi Sakamoto, Yugo Takeuchi (Shizuoka University)

D05. An Open Hardware and Software Microphone Array System for Robotic Applications

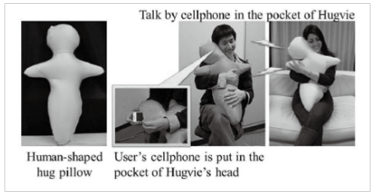


François Grondin, Dominic Létourneau, François Ferland, François Michaud (Université de Sherbrooke)

D06. The Design of Social Robot

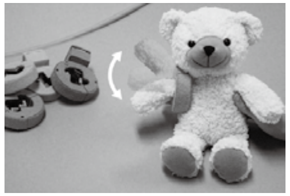
Seita Koike (Tokyo City University)

D07. Evoking an Affection for Communication Partner by a Robotic Communication Medium



Takashi Minato, Shuichi Nishio (ATR), Hiroshi Ishiguro (Osaka University)

D08. PINOKY: A Ring That Animates Your Plush Toys



Yuta Sugiura, Yasutoshi Makino (Keio University), Daisuke Sakamoto (The University of Tokyo), Masahiko Inami (Keio University), Takeo Igarashi (The University of Tokyo)

D09. A Surrogate Robot with Deictic Pointing Capability

Hiroaki Kawanobe, Yoshifumi Aosaki, Hideaki Kuzuoka (University of Tsukuba), Yusuke Suzuki (Oki Electric Industry Co., Ltd.)

D10. Interaction with Blended Reality Agent "BReA"

Yusuke Kanai, Hirotaka Osawa, Michita Imai (Keio University)

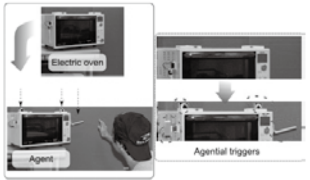
D11. Sociable Creatures for Child-Robot Interaction Studies

Yasutaka Takeda, Shohei Sawada, Tatsuya Mori, Kohei Yoshida, Yu Arita, Takahiro Asano, Naoki Ohshima, Ravindra De Silva, Michio Okada (Toyohashi University of Technology)

D12. Physiotherapy demonstration with NAO

David López Recio, Elena Márquez Segura (Mobile Life), Luis Márquez Segura (Fonserrana S.C.A de interés social), Annika Waern (Mobile Life)

D13. Human-Agent Interaction by Transformative Agential Triggers

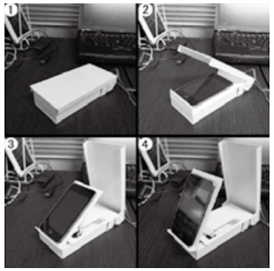


Hirotaka Osawa, Michita Imai (Keio University)

D14. Superimposed Self-Character Mediated Video Chat System for Face-to-Face Interaction Based on the Detection of Talkers' Face Angles

Tomohiro Takada, Shiho Nakayama, Yutaka Ishii, Tomio Watanabe (Okayama Prefectural University)

D15. Shape Shifting Information Notification based on Peripheral Cognition Technology



Kazuki Kobayashi (Shinshu University), Seiji Yamada (National Institute of Informatics)

D16. Perceiving the Active Chair: Agent or Machine?

Peng Li, Kazunori Terada, Akira Ito (Gifu University)

D17. Building Table-Talk Agents that Create a Pleasant Atmosphere

Masahide Yuasa (Tokyo Denki Univ.)

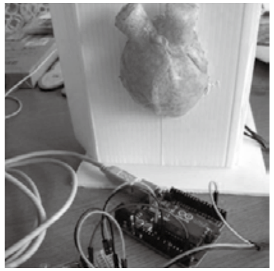
D18. Robot Gangnam Style!

Eduardo Sandoval, Christoph Bartneck (University of Canterbury)

D19. Attitude-Aware Communication Behaviors of a Partner Robot: Politeness for the Master

Tomoko Yonezawa (Kansai University), Hirotake Yamazoe (Osaka University), Yuichi Koyama (Nagoya University), Naoto Yoshida (Kansai University), Shinji Abe (Hiroshima Institute of Technology), Kenji Mase (Nagoya University)

D20. Ikitomical Model: Extended Body Sensation through a Cardiovascular Robot

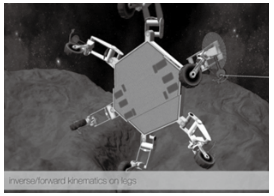


Yuka Nagata, Yuka Niimoto, Naoto Yoshida, Tomoko Yonezawa (Kansai University)

D21. Exploring Anti-Social Behavior as a Method to Understand Aspect of Social Behavior

Takao Watanabe, Masakatsu Fujie (Waseda University), Angelika Mader, Edwin Dertien (University of Twente)

D22. Natural 3D Controls for Space Robotic Systems

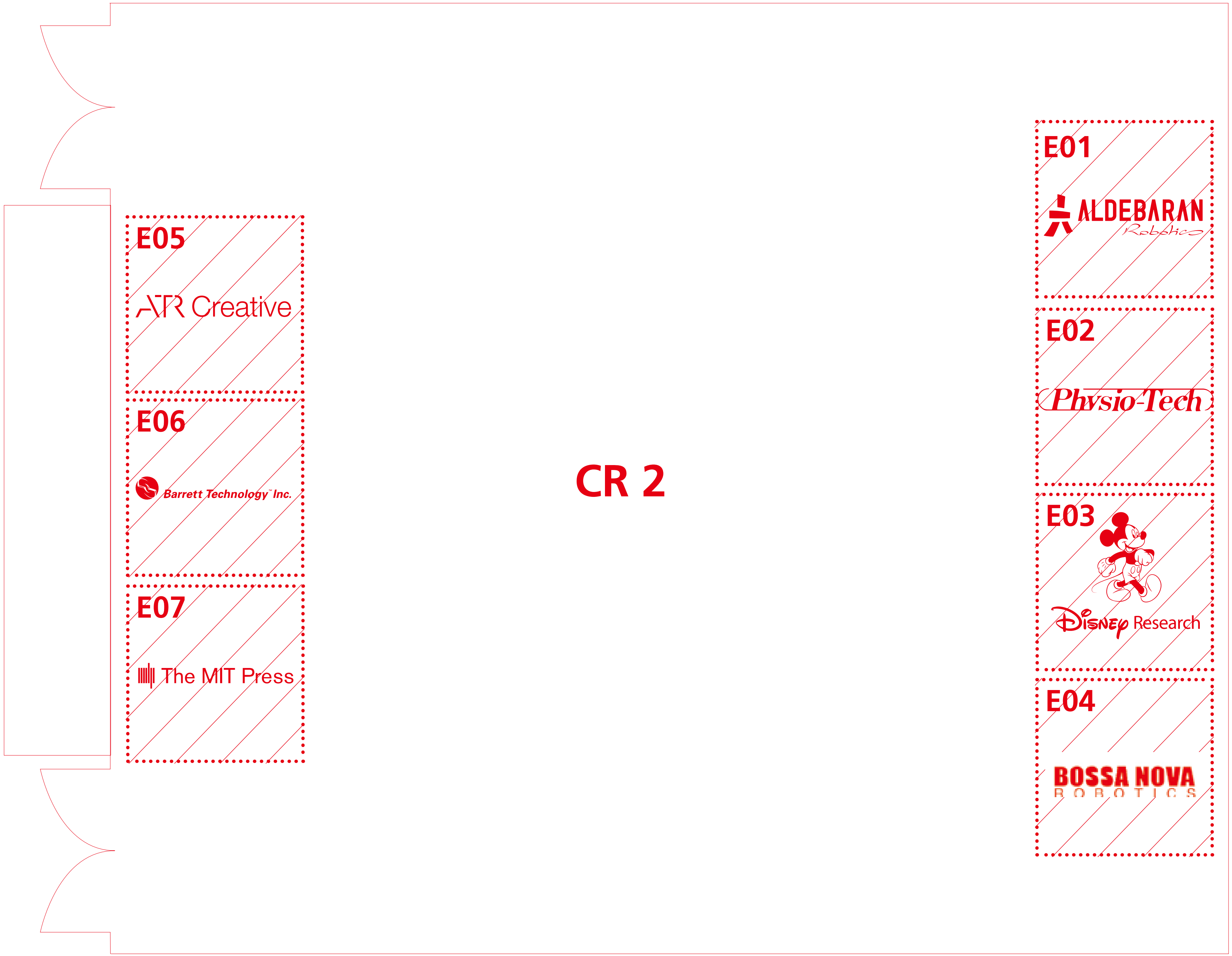


Garrett Johnson, Victor Luo, Alex Menzies, David Mittman, Jeffrey Norris, Scott Davidoff (NASA Jet Propulsion Laboratory)

Exhibition

Sun, 3/3~Wed, 3/6
CR2

E01: Aldebaran Robotics
E02: Physio-Tech Co., Ltd
E03: Disney Research
E04: Bossa Nova Robotics
E05: ATR Creative
E06: Barrett Technology
E07: The MIT Press



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9th ACM/IEEE International Conference on Human-Robot Interaction (HRI 2014)
March 3-6, 2014 in Bielefeld (Germany)
http://www.humanrobotinteraction.org/2014/

(E)Merging Perspectives

Progress in research on human-robot interaction is commonly driven by either a user's or a system's perspective. However, what does it mean to interweave both system-driven approaches and empirical research in order to advance new and possibly unorthodox methodologies? To extend current approaches, we strongly call for papers that demonstrate the usage of novel empirical methods, the integration of empirical findings into complex robot systems, and systemic approaches to evaluate systems.

Conference Venue. Intelligent Systems research building at Bielefeld University (Germany): http://www.campus-bielefeld.de/en/campus-bielefeld-2025/

Important Dates. September 10, 2013: Submission of full papers, videos, and tutorial / workshop proposals (tentative).

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Human-Robot Interaction @ Bielefeld University

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