HAI 2016

4 - 7 OCTOBER
SINGAPORE

4th International Conference on Human-Agent Interaction

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HAI 2016 Chairs' Welcome

It is our great pleasure to welcome you to *The Fourth International Conference on Human-Agent Interaction* (HAI 2016) and the vibrant city of Singapore. HAI has grown beyond our expectations in last three years and this year's HAI continues its tradition of being the relevant forum for presentation of research results and experience reports on leading edge issues of Human-Agent Interaction. HAI gathers researchers from fields spanning engineering, computer science, psychology, sociology and cognitive science while covering diverse topics including Human-Virtual/Physical agent interaction, communication and interaction with smart home/smart cars, and modeling of those interactions.

The mission of the conference is to share novel quantitative and qualitative research on human and artificial agent interaction and identify new directions for future research and development. HAI gives researchers and practitioners a unique opportunity to share their perspectives with others interested in the various aspects of human-agent interaction.

The theme for HAI 2016 is "Machine learning methods and multimodal interfaces to achieve social intelligence in robots, avatars, and virtual characters". The programme for HAI 2016 includes two exciting keynote talks by the world leaders in areas related to human-agent interaction: Prof. David Hsu of the National University of Singapore and Prof. Leila Takayama of University of California, Santa Cruz and Researcher, Hoku Labs. We encourage participants to attend them.

This year, we saw a record number of submissions in full paper, late-breaking poster as well as workshop proposal categories. The programme committee has unanimously remarked on the exceptional quality of this year's submissions and had a tough time playing the role of the gatekeeper with the acceptance rate of 43.9%. Our final programme features 29 oral presentations, 46 poster presentations, 2 tutorials and 3 workshops. All of them present latest research results and ideas of interest to HAI researchers. It will also be a good avenue for researchers from all over the world to discuss and network, hopefully generating new ideas and seeding new collaborations.

In addition to the stimulating conference programme, Singapore, with its tourist attractions, cultural diversity and top-notch quality cuisine, is one of the all-time favourite place to visit. With a recent conferment of 29 Michelin Star restaurants which include affordable hawker stalls, we hope that you will get a chance to explore Singapore and enjoy the sumptuous culinary experience in the vibrant city state.

HAI 2016 @ one-north would not be a great success without the dedicated team behind the scene. On behalf of the Organising Committee, we would like to thank the Advisory Board for their advice, the Technical Programme Committee and hundreds of reviewers led by the Programme Chairs for their contributions to a wonderful technical programme. We would like to express our gratitude to the keynote speakers, tutorial speakers and workshop organisers for augmenting the programme of this edition of the HAI conference series. In addition, the Organising Committee works tirelessly to ensure the quality of the conference and the best experience for the delegation. We would also like to thank our corporate sponsors, Hokuyo and Orcadesign. They enabled us to provide a better experience while keeping the registration fee affordable. Finally, we would also like to thank ACM SIGCHI, our in-cooperation partner; as well as the IEEE System, Man and Cybernetics Society, Singapore Chapter and IEEE Computer Society, Singapore Chapter, our technical co-sponsors.

We hope that you will find this program interesting as well as thought provoking and that the symposium will provide you with a valuable opportunity to share ideas with other researchers and practitioners from institutions around the world.

Wei-Yun Yau
HAI 2016 General Co-Chair, Institute for Infocomm Research, A*STAR, Singapore

Takashi Omori
HAI 2016 General Co-Chair Tamagawa University, Tokyo, Japan

Shengdong Zhao
HAI 2016 Program Co-Chair National University of Singapore, Singapore

Hirotaka Osawa
HAI 2016 Program Co-Chair University of Tsukuba, Japan

Giorgio Metta
HAI 2016 Program Co-Chair Italian Institute of Technology, Italy

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Vassilios Vonikakis, Advanced Digital Sciences Center, Singapore
Stefan Winkler, Advanced Digital Sciences Center, Singapore
Tomoko Yonezawa, Kansai University, Japan
Agnieszka Wykowska, Technische Universität München, Germany
Kening Zhu, City University of Hong Kong, Hong Kong SAR

HAI 2016 Programme Schedule

Time\Date	4 Oct			5 Oct	6 Oct	7 Oct
08.30-08.50	Registration and Networking					
08.50-09.00				OC		
09.00-09.30	1	1	3	KS I	MT V	MT IX
09.30-10.00						
10.00-10.30	Tea Break					
10.30-11.00	Tutorial	Workshop	Workshop	MT I	MT VI	IP III
11.00-11.30						
11.30-12.00				MT II	MT VII	MT X
12.00-12.30						
12.30-13.00	Lunch					
13.00-13.30						
13.30-14.00	2	2	3	PP I	KS II	Programme
14.00-14.30				IP I		
14.30-15.00	Tutorial	Workshop	Workshop		PP II	
15.00-15.30				MT III	IP II	
15.30-16.00						
16.00-16.30	Tea Break					Social
16.30-17.00				MT IV	MT VIII	
17.00-17.30						
17.30-18.00	End-of-Day / Transportation					
18.00-18.30						
18.30-				WR	CB	

Abbreviations:

KS Keynote Speech

IP Interactive Poster Session

OC Opening Ceremony

CB Conference Banquet

MT Main Track Session

PP Poster Presentation Session

WR Welcome Reception

Program Overview

Day 1 (Tuesday, 4 Oct 2016)			
08:30 -- 09:00	Registration and Networking		
09:00 -- 12:30	Tutorial I Venue: Potential, L13 Connexis North Tower, Fusionopolis	Workshop I Venue: Transform, L13 Connexis North Tower, Fusionopolis	Workshop III Venue: Resonance, L13 Connexis North Tower, Fusionopolis
12:30 -- 13:30	Lunch		
13:30 -- 17:30	Tutorial II Venue: Transform, L13 Connexis North Tower, Fusionopolis	Workshop II Venue: Potential, L13 Connexis North Tower, Fusionopolis	Workshop III Venue: Resonance, L13 Connexis North Tower, Fusionopolis
Venue (Day 2–Day 4)	Breakthrough Theatre, L4 Matrix, Biopolis		
Day 2 (Wednesday, 5 Oct 2016)			
08:30 -- 08:50	Registration and Networking		
08:50 -- 09:00	Opening Remarks		
09:00 -- 10:00	Keynote Speech I: Robots in Harmony with Humans Speaker: Prof. David Hsu		
10:00 -- 10:30	Tea Break		
10:30 -- 11:30	Main Track Session I: Designing Interactions Chair: Masato Shiomi, Co-chair: Kazuki Kobayashi		
11:30 -- 12:30	Main Track Session II: Power of Groups Chair: Takamasa Iio, Co-chair: Sinhwa Kang		
12:30 -- 13:30	Lunch		
13:30 -- 14:00	Poster Presentation Session I Chair: Karunanayaka Kasun		
14:00 -- 15:00	Interactive Poster Session I Chair: Franz Kummert, Co-Chair: Karunanayaka Kasun		
15:00 -- 16:00	Main Track Session III: Modelling Interactions Chair: Sho Sakurai, Co-chair: Yugo Takeuchi		
16:00 -- 16:30	Tea Break		
16:30 -- 17:30	Main Track Session IV: Emotions and Inner States Chair: Tomoko Koda, Co-chair: Adam Miner		
18:30 --	Welcome Reception Location: MPH, Innovis, Fusionopolis		

Day 3 (Thursday, 6 Oct 2016)	
08:30 -- 09:00	Registration and Networking
09:00 -- 10:00	Main Track Session V: Extending Body Image Chair: Hirotaka Osawa, Co-chair: Tetsushi Oka
10:00 -- 10:30	Tea Break
10:30 -- 11:30	Main Track Session VI: Human Characteristics Chair: Hideyuki Nakanishi, Co-chair: Andreea Ioana Niculescu
11:30 -- 12:30	Main Track Session VII: Communication Cues Chair: Kazunori Terada, Co-chair: Tomio Watanabe
12:30 -- 13:30	Lunch
13:30 -- 14:30	Keynote Speech II: Perceptions of Agency in Human-Robot Interactions Speaker: Leila Takayama
14:30 -- 15:00	Poster Presentation Session II Chair: Hayashi Yugo
15:00 -- 16:00	Interactive Poster Session II Chair: Yuanwei Chua, Co-Chair: Hayashi Yugo
16:00 -- 16:30	Tea Break
16:30 -- 17:30	Main Track Session VIII: Interaction Tactics Chair: Michita Imai, Co-chair: Yasuhiko Kitamura
18:30 --	Conference Banquet Location: Jumbo Seafood Restaurant
Day 4 (Friday, 7 Oct 2016)	
08:30 -- 09:00	Registration and Networking
09:00 -- 10:00	Main Track Session IX: Supporting Work Chair: Andreas Kipp, Co-chair: Yoshimasa Ohmoto
10:00 -- 10:30	Tea Break
10:30 -- 11:30	Interactive Poster Session III Chair: Albertus H. Adiwahono, Co-Chair: Britta Wrede
11:30 -- 12:30	Main Track Session X: Agents in Real-World Chair: Tomoko Yonezawa, Co-chair: Luis Fernando D'Haro
12:30 -- 13:30	Lunch
14:00 -- 17:30	Social Program Location: City center

Invited talks

Date: Wednesday, 5 October 2016, 09:00 – 10:00

Location: Matrix Breakthrough Theatre, Biopolis

Title: Robots in Harmony with Humans

Speaker: Prof. David Hsu, National University of Singapore

Abstract:

In early days, robots often occupied tightly controlled environments, for example, factory floors, designed to segregate robots and humans for safety. Today robots "live" with humans, providing a variety of services at homes, in workplaces, or on the road. To become effective and trustworthy collaborators, robots must understand human intentions and act accordingly in response. One core challenge here is the inherent uncertainty in understanding intentions, as a result of the complexity and diversity of human behaviours. Robots must hedge against such uncertainties to achieve robust performance and sometimes actively elicit information in order to reduce uncertainty and ascertain human intentions. Our recent work explores planning and learning under uncertainty for human-robot interactive or collaborative tasks. It covers mathematical models for human intentions, planning algorithms that connect robot perception with decision making, and learning algorithms that enable robots to adapt to human preferences. The work, I hope, will spur greater interest towards principled approaches that integrate perception, planning, and learning for fluid human-robot collaboration.

Biography:

David Hsu is a professor of computer science at the National University of Singapore, a member of NUS Graduate School for Integrative Sciences & Engineering (NGS), and deputy director of the Advanced Robotics Center. His current research focuses on robotics and AI.

He received B.Sc. in computer science & mathematics from the University of British Columbia, Canada and Ph.D. in computer science from Stanford University, USA. After leaving Stanford, he worked at Compaq Computer Corp.'s Cambridge Research Laboratory and the University of North Carolina at Chapel Hill. At the National University of Singapore, he held the Sung Kah Kay Assistant Professorship and was a Fellow of the Singapore-MIT Alliance. He is currently serving as the general co-chair of IEEE International Conference on Robotics & Automation 2016, the general chair of Robotics: Science & Systems 2016, a steering committee member of International Workshop on the Algorithmic Foundation of Robotics, and an editorial board member of Journal of Artificial Intelligence Research. He and his team of colleagues and students won the Humanitarian Robotics and Automation Technology Challenge Award at the International Conference on Robotics & Automation (ICRA) 2015 and the RoboCup Best Paper Award at IEEE/RSJ International Conference on Intelligent Robots & Systems (IROS) 2015.

Date: Thursday, 6 October 2016, 13:30 – 14:30

Location: Matrix Breakthrough Theatre, Biopolis

Title: Perceptions of Agency in Human-Robot Interactions

Speaker: Leila Takayama, Hoku Labs

Abstract:

Robots are no longer only in outer space, in factory cages, or in our imaginations. We interact with robotic agents when withdrawing cash from ATMs, driving cars with anti-lock brakes, and tuning our thermostats. In the moment of those interactions with robotic agents, we behave in ways that do not necessarily align with the rational belief that robots are just plain machines. Through a combination of controlled experiments and field studies, we will examine the ways that people make sense of robotic agents, including (1) how people interact with personal robots and (2) how people interact through telepresence robots. These observations and experiments raise questions about the psychology of human-agent interaction, particularly about issues of perceived agency and the incorporation of technologies into one's sense of self.

Biography:

Leila Takayama is a human-robot interaction researcher. This year, she founded Hoku Labs and joined the faculty at the University of California, Santa Cruz, as an acting associate professor of Psychology. Prior to UC Santa Cruz, she was a senior user experience researcher at GoogleX, and was a research scientist and area manager for human-robot interaction at Willow Garage. She is a World Economic Forum Global Agenda Council Member and Young Global Leader. Last year, she was presented the IEEE Robotics & Automation Society Early Career Award. In 2012, she was named a TR35 winner and one of the 100 most creative people in business by Fast Company.

With a background in Psychology, Cognitive Science, and Human-Computer Interaction, she examines human encounters with new technologies. Dr. Takayama completed her PhD in Communication at Stanford University in 2008, advised by Professor Clifford Nass. She also holds a PhD minor in Psychology from Stanford, a master's degree in Communication from Stanford, and bachelor's of arts degrees in Psychology and Cognitive Science from UC Berkeley (2003). During her graduate studies, she was a research assistant in the User Interface Research (UIR) group at Palo Alto Research Center (PARC).

Tutorials and Workshops

Tutorial I

Date: Tuesday, 04 October 2016 09:00 - 12:30

Location: Potential, L13 Connexis North Tower, Fusionopolis

Title: Natural Language in Human-Robot Interaction

Speaker: Dr. Rafael E. Banchs, Dr. Seokhwan Kim, Dr. Luis Fernando D'Haro and Dr. Andreea I. Niculescu

Abstract:

In this tutorial, we present a comprehensive description of natural language interaction technologies along with its current and potential uses in human-robot interaction applications. First, we describe some fundamental concepts on perception, cognition, cognitive semantics, and multimodal semantics, focusing on the role of language as the main means for human-human communication. Second, we focus our attention on the problems of natural language understanding and dialogue, including the role of pragmatics on human's usage of language. Then, communication interfaces are described along with the notion of conversational agents and its most common applications. Finally, the importance of design and embodiment in the success of deploying human-robot interfaces based on natural language is discussed, along with user studies and evaluation strategies.

Tutorial II

Date: Tuesday, 04 October 2016 13:30 - 17:00

Location: Transform, L13 Connexis North Tower, Fusionopolis

Title: Biological Data Analysis with Semi-Parametric Estimation and Bayesian Nonparametrics

Speaker: Prof. Kazushi Ikeda and Assoc. Prof. Takatomi Kubo

Abstract:

Nowadays, machine learning and Bayesian inference are strong tools in Web Technology, Internet of Things, and Natural Sciences. This tutorial gives a basic idea of machine learning and Bayesian inference first, and show how to apply new machine learning models, semi-parametric estimation and Bayesian nonparametrics.

Date: Tuesday, 04 October 2016 09:00 - 12:30

Location: Transform, L13 Connexis North Tower, Fusionopolis

Title: Enrobotment or Toy Robots in the Developing Brain

Organizers: Dr. Irini Giannopulu and Prof. Tomio Watanabe

Abstract:

Based on the internalised "object" and using cognitive, clinical, neuro functional and engineering arguments, this workshop analyses the concept of "enrobotment". Playing with objects/toys (including the imperceptible part, i.e., the shadow) implies that the objects/toys are part of the external environment, i.e., the "other". The enrobotment signifies that object's internalisation not only reflects the impact of the environment on child's development but it also reverberates the echo of child's representations. An intermediate object (including its shadow) is conceived in mind by the child him/herself. Having a high emotional value and forming an implicit/explicit autobiographical continuum in memory, it ensures the cohesion between the "self" and "other", it authorises subjectification. The correlated representations allow the invention of ideas and concepts; motor and verbal actions including their intention prosper. Intention attribution to objects/toys constitutes a precursor of self-consciousness, as this intention, a specific anticipation, helps children to understand what it signifies to have a perspective. Recognizing what it implies to be a "self" is a parcel of envisioning mental states of "other". At the antipode, autism can be considered as an antithesis of selfconsciousness. Children with autism cannot mirror the triadic relationship of "object-self-other".

Speakers:

WS1-1: **User Generated Agent: Designable Book Recommendation Robot by Children**
Dr. Hirotaka Osawa, Tsukuba University

WS1-2: **Cognitive Development of Mind-Reading and Behavior-Reading**
Dr. Kazunori Terada, Gifu University

WS1-3: **Stepwise Experience Design of Tactile Interaction in Children's Enrobotment**
Dr. Tomoko Yonezawa, Kansai University

WS1-4: **Dynamics of Prediction Error Minimization For The Emergence of Turn-taking**
Dr. Konstantinos Theofilis, Osaka University

WS1-5: **Emotional Empathy in Children aged 6 Years old via a Toy Robot: A Comparative Study**
Dr. Irini Giannopulu, UPMC University

Program Committee members:

Dr. Valérie Montreynaud, CMP, France
Prof. Tomio Watanabe, Okayama University, Japan
Prof. Kevin Grimes, Karolinska Institute, Sweden
Dr. Irini Giannopulu, UPMC, France
Prof. Hannes Bleuler, Ecole Polytechnique
Fédérale de Lausanne, Switzerland

Date: Tuesday, 04 October 2016 13:30 - 18:30

Location: Potential, L13 Connexis North Tower, Fusionopolis

Title: Next Generation Human-Agent Interaction Workshop

Organizers: Dr. Komei Hasegawa and Dr. Chie Hieida

Speakers:

WS2-1: **Designing a Multimodal Haptic Device for Virtual Kissing**
Emma Yann Zhang, Adrian David Cheok

WS2-2: **Thermal Sweet Machine - A Digital Interface for Multisensory Network Communication**
Nur Amira Samshir, Nurafiqah Johari, Kasun Karunanayaka, Adrian David Cheok

WS2-3: **Magnetic Table Interface and Magnetic Foods**
Nur Ellyza Abd Rahmani, Azhri Azhar, Kasun Karunanayaka, Adrian David Cheok, Mohammad Abdullah Mohamad Johar, Jade Gross, Andoni Luis Aduriz

WS2-4: **Electrical Stimulation of Olfactory Receptors for Digitizing Smell**
Surina Hariri, Nur Ain Mustafa, Kasun Karunanayaka, Adrian David Cheok

WS2-5: **Considering the Interaction of Humans and Music from a Human-Agent Interaction Approach**
Benjamin Luke Evans, Nagisa Munekata, Tetsuo Ono

WS2-6: **Modeling "Model of Others" using Deep Q-Network**
Tuan Anh Nguyen, Chie Hieida, Takayuki Nagai

WS2-7: **Modeling of Physical Interaction by the Dyadic Communication Needs for the Recognition and the Expression**
Genta Yoshioka, Yugo Takeuchi

Date: Tuesday, 04 October 2016 09:00 - 17:30

Location: Resonance, L13 Connexis North Tower, Fusionopolis

Title: Universal Translation

Organizers: Ms. Ai Ti Aw and Prof. Haizhou Li

Speakers:

WS3-1: **Comparison of Grapheme-to-Phoneme Conversion Methods on a Myanmar Pronunciation Dictionary**
Ye Kyaw Thu and Win Pa Pa
Language and Speech Science Research Lab, Waseda University, Tokyo, Japan
Natural Language Processing Lab, University of Computer Studies, Yangon, Myanmar

WS3-2: **The Effect of Dialect on the Syllable Accuracy of Vietnamese Continuous Speech Recognition System**
NGUYEN Hong Quang and TRINH Van Loan
Hanoi University of Science and Technology, Vietnam

WS3-3: **Vietnamese LVCSR Development and Improvement**
Van Huy Nguyen, Quoc Bao Nguyen, Chi Mai Luong and Tat Thang Vu
Thai Nguyen University of Technology, Vietnam
Thai Nguyen University of Information and Communication Technology
Institute of Information Technology (IOIT), Vietnam Academy of Science and Technology, Vietnam

WS3-4: **Towards Indonesian Speech-to-Speech Translation System**
Agung Santosa, Hammam Riza, M. Teduh Ulinansyah, Gunarso, Made Gunawan, Elvira Nurfadhilah, Lyla R Aini, Harnum Annisa and Fara Ayuningtyas
Center for ICT – BPPT, Jakarta, Indonesia

WS3-5: **Network-based Speech Translation Services**
Zhongwei Li, Ai Ti Aw, Sharifah Mahani Aljunied, Haizhou Li, Rapid Sun, Vichet Chea, Hammam Riza, Sevia M. Idrus, Rubita Sudirman, Faizah Mohamad Nor, Khin Mar Soe, Win Pa Pa, Chai Wutiwiwatchai, Thepchai Supnithi, NGUYEN Hong Quang, NGUYEN Thi Thu Trang, Luong Chi Mai, Vu Tat Thang
"ASEAN Language Speech Translation thru' U-STAR" Project Team

WS3-6: **Context-Dependent Bilingual Word Embedding with Sentence Similarity Constraint for Machine Translation**
Kui Wu, Xuancong Wang, Ai Ti Aw
Institute for Infocomm Research, A*STAR, Singapore

WS3-7: **Extracting Parallel Sentences from Movie Subtitles**
Boon Hong Yeo, Ai Ti Aw, Xuancong Wang
Institute for Infocomm Research, A*STAR, Singapore

WS3-8: **An approach for Vietnamese-Japanese Statistical Machine Translation (SMT)**
NGUYEN Thi Thu Trang, LE Thanh Huong
Hanoi University of Science and Technology, Vietnam

WS3-9: **Natural Language Processing Development Trends in Malaysia and the Way Forward**
Sevia Mahdaliza Idrus, Rubita Sudirman, Faizah Mohamad Nor
Universiti Teknologi Malaysia, Malaysia

Main Conference Sessions

Day 2, 5 Oct 2016, Wednesday

Main Track Session I (MT1), 10:30 – 11:30
Designing Interactions: Studies for Challenging Border of Interaction

Chair: Masato Shiomi, Co-chair: Kazuki Kobayashi

MT1-01: Perception of Animacy by the Linear Motion of a Group of Robots
       Momoka Nakayama, Shunji Yamanaka

MT1-02: Exploring Social Interaction with Everyday Object based on Perceptual Crossing
       Siti Aisyah binti Anas, Shi Qiu, Matthias Rauterberg, Jun Hu

MT1-03: Pre-Scheduled Turn-Taking between Robots to Make Conversation Coherent
       Takamasa Iio, Yuichiro Yoshikawa, Hiroshi Ishiguro

Main Track Session II (MT2), 11:30 – 12:30
Power of Groups: Studies of Using Effect from Multiple Agents

Chair: Takamasa Iio, Co-chair: Sinhwa Kang

MT2-01: Do Synchronized Multiple Robots Exert Peer Pressure?
       Masahiro Shiomi, Norihiro Hagita

MT2-02: NAMIDA: Sociable Driving Agents with Multiparty Conversation
       Nihan Karatas, Soshi Yoshikawa, Michio Okada

MT2-03: Are You Talking to Me? Improving the Robustness of Dialogue Systems in a Multi Party HRI Scenario by Incorporating Gaze Direction and Lip Movement of Attendees
       Viktor Richter, Birte Carlmeyer, Florian Lier, Sebastian Meyer zu Borgsen, David Schlangen, Franz Kummert, Sven Wachsmuth, Britta Wrede

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Main Track Session III (MT3), 15:00 – 16:00
Modelling Interactions: Theoretical Challenges that Focuses on Design of Interaction

Chair: Sho Sakurai, Co-chair: Yugo Takeuchi

MT3-01: Building Trust in PRVAs by User Inner State Transition through Agent State Transition
       Tetsuya Matsui, Seiji Yamada

MT3-02: The Use of The BDI Model As Design Principle for A Migratable Agent
       Mamoru Yamanouchi, Taichi Sono, Michita Imai

MT3-03: Conversational Agents and Mental Health: Theory-Informed Assessment of Language and Affect
       Adam Miner, Amanda Chow, Sarah Adler, Ilia Zaitsev, Paul Tero, Alison Darcy, Andreas Paepcke

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Main Track Session IV (MT4), 16:30 – 17:30
Emotions and Inner States: Studies about Usage of Internal States of Agents

Chair: Tomoko Koda, Co-chair: Adam Miner

MT4-01: Improving Smartphone Users' Affect and Wellbeing with Personalized Positive Psychology Interventions
       Sooyeon Jeong, Cynthia Lynn Breazeal

MT4-02: Investigating Breathing Expression of a Stuffed-Toy Robot Based on Body-Emotion Model
 Naoto Yoshida, Tomoko Yonezawa

MT4-03: Sharing Emotion Described as Text on the Internet by Changing Self-Physiological Perception
 Sho Sakurai, Yuki Ban, Toki Katsumura, Takuji Narumi, Tomohiro Tanikawa, Michitaka Hirose

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Poster Presentation Session I (PP1), 13:30—14:00

Chair: Karunanayaka Kasun

IP1-02: Whispering Bubbles: Exploring Anthropomorphism through Shape-Changing Interfaces
 Shi Qiu, Siti Aisyah Anas, Jun Hu

IP2-02: "Look at Me!" -- Self-Interruptions as Attention Booster?
 Birte Carlmeyer, David Schlangen, Britta Wrede

IP1-06: Cross-Cultural Study of Perception and Acceptance of Japanese Self-adaptors
 Takuto Ishioh, Tomoko Koda

Interactive Poster Session I (IP1), 14:00—15:00

Chair: Franz Kummert, Co-Chair: Karunanayaka Kasun

IP1-01: Visual Tracking of Human Gestures under Field-of-View Constraints
 Keng Peng Tee, Yuanwei Chua, Zhiyong Huang

IP1-02: Whispering Bubbles: Exploring Anthropomorphism through Shape-Changing Interfaces
 Shi Qiu, Siti Aisyah Anas, Jun Hu

IP1-03: Model-Driven Gaze Simulation for the Blind Person in Face-to-Face Communication
 Shi Qiu, Siti Aisyah Anas, Hirotaka Osawa, Matthias Rauterberg, Jun Hu

IP1-04: Investigation of Practical Use of Humanoid Robots in Elderly Care Centres
 Zhuoyu Shen, Yan Wu

IP1-05: User Generated Agent: Designable Book Recommendation Robot Programmed by Children
 Yusuke Kudo, Wataru Kayano, Takuya Sato, Hirotaka Osawa

IP1-06: Cross-Cultural Study of Perception and Acceptance of Japanese Self-Adaptors
 Takuto Ishioh, Tomoko Koda

IP1-07: Modulating Dynamic Models for Lip Motion Generation
 Singo Sawa, Hiroaki Kawashima, Kei Shimonishi, Takashi Matsuyama

IP1-08: Magnetic Dining Table Interface and Magnetic Foods for New Human Food Interactions
 Nur Ellyza Abd Rahman, Azhri Azhar, Kasun Karunanayaka, Adrian David Cheok, Mohammad Abdullah Mohamad Johar, Jade Gross, Andoni Luis Aduriz

IP1-09: A Study on Trust in Pharmacists for Better HAI Design
 Jia Qi Lim, Nicole Sze Ting Lim, Maya Zheng, Swee Lan See

IP1-10: Development of a Simulated Environment for Recruitment Examination and Training of High School Teachers
 Masato Fukuda, Hung-Hsuan Huang, Tetsuya Kanno, Naoki Ohta, Kazuhiro Kuwabara

IP1-11: Ex-Amp Robot: Physical Avatar for Enhancing Human to Human Communication
 Ai Kashii, Kazunori Takashio, Hideyuki Tokuda

IP1-12: **Interaction in a Natural Environment: Estimation of Customer's Preference Based on Nonverbal Behaviors**
Hidehito Honda, Ryosuke Hisamatsu, Yoshimasa Ohmoto, Kazuhiro Ueda

IP1-13: **Ear Ball for Empathy: To Realize the Sensory Experience of People with Autism Spectrum Disorder**
Taisuke Murakami

IP1-14: **Process of Agency Identification Based on the Desire to Communicate in Embodied Interaction**
Takafumi Sakamoto, Yugo Takeuchi

IP1-15: **Can Children Anthropomorphize Human-shaped Communication Media?: a Pilot Study on Co-Sleeping with a Huggable Communication Medium**
Junya Nakanishi, Hidenobu Sumioka, Hiroshi Ishiguro

IP1-16: **A Multimodal Control Architecture for Autonomous Unmanned Aerial Vehicles**
Marco Antonio Gutierrez, Luis Fernando D'Haro, Rafael Enrique Banchs

Day 3, 6 Oct 2016, Thursday

Main Track Session V (MT5), 09:00 – 10:00
Extending Body Image: Studies for Extending Agent's Appearance. Mainly on Telepresence

Chair: Hirotaka Osawa, Co-chair: Tetsushi Oka

MT5-01: Synthesizing Realistic Image-based Avatars by Body Sway Analysis
    Masashi Nishiyama, Tsubasa Miyauchi, Hiroki Yoshimura, Yoshio Iwai

MT5-02: Who am I Touching ?: User Study of Remote Handshaking with a Telepresence Face
    Kana Misawa, Jun Rekimoto

MT5-03: Embodiment of Video-mediated Communication Enhances Social Telepresence
    Yuya Onishi, Kazuaki Tanaka, Hideyuki Nakanishi

Main Track Session VI (MT6), 10:30 – 11:30
Human Characteristics: Survey and Applications about Usage of Human-Likeness

Chair: Hideyuki Nakanishi, Co-chair: Andreea Ioana Niculescu

MT6-01: Investigating Effects of Professional Status and Ethnicity in Human-Agent Interaction
    Mohammad Obaid, Maha Salem, Micheline Ziadee, Halim Boukaram, Elena Moltchanova, Majd Sakr

MT6-02: Does a Conversational Robot Need to Have its Own Values? A Study of Dialogue Strategy to Enhance People's Motivation to Use Autonomous Conversational Robots
    Takahisa Uchida, Takashi Minato, Hiroshi Ishiguro

Main Track Session VII (MT7), 11:30 – 12:30
Communication Cues: Studies about Cues of Interaction Between Human and Agents

Chair: Kazunori Terada, Co-chair: Tomio Watanabe

MT7-01: Alignment Approach Comparison between Implicit and Explicit at Object Reference Conversation
    Mitsuhiko Kimoto, Takamasa Iio, Masahiro Shiomi, Ivan Tanev, Katsunori Shimohara, Norihiro Hagita

MT7-02: Communication Cues in a Human-Robot Touch Interaction
    Takahiro Hirano, Masahiro Shiomi, Takamasa Iio, Mitsuhiko Kimoto, Takuya Nagashio, Ivan Tanev, Katsunori Shimohara, Norihiro Hagita

MT7-03: Humotion -- A Human Inspired Gaze Control Framework for Anthropomorphic Robot Heads
    Simon Schulz, Florian Lier, Andreas Kipp, Sven Wachsmuth

Main Track Session VIII (MT8), 16:30 – 17:30
Interaction Tactics: Studies about Design of Interaction, not always Cooperative. Mainly Games

Chair: Michita Imai, Co-chair: Yasuhiko Kitamura

MT8-01: A Leader-Follower Relation between a Human and an Agent
    Kazunori Terada, Seiji Yamada, Kazuyuki Takahashi

MT8-02: "I Know How You Performed!" - Fostering Engagement in a Gaming Situation Using Memory of Past Interactions
    Andreas Kipp, Franz Kummert

MT8-03: Children's Facial Expressions in Truthful and Deceptive Interactions with a Virtual Agent
    Mariana Serras Pereira, Jolanda de Lange, Suleman Shahid, Marc Swerts

Poster Presentation Session II, 14:30—15:00

Chair: Hayashi Yugo

IP1-08: Magnetic Dining Table Interface and Magnetic Foods for New Human Food Interactions
Nur Ellyza Abd Rahman, Azhri Azhar, Kasun Karunanayaka, Adrian David Cheok, Mohammad Abdullah Mohamad Johar, Jade Gross, Andoni Luis Aduriz

IP1-09: A Study on Trust in Pharmacists for Better HAI Design
Jia Qi Lim, Nicole Sze Ting Lim, Maya Zheng, Swee Lan See

IP2-05: Forming Intimate Human-Robot Relationships Through A Kissing Machine
Emma Yann Zhang, Adrian David Cheok

Interactive Poster Session II (IP2), 15:00—16:00

Chair: Yuanwei Chua, Co-Chair: Hayashi Yugo

IP2-01: Human-Robot Cooperative Conveyance Using Speech and Head Gaze
Tetsushi Oka, Sho Uchino

IP2-02: "Look at Me!" -- Self-Interruptions as Attention Booster?
Birte Carlmeyer, David Schlangen, Britta Wrede

IP2-03: Investigation on Effects of Color, Sound, and Vibration on Human's Emotional Perception
Sichao Song, Seiji Yamada

IP2-04: Voting-Based Backchannel Timing Prediction Using Audio-Visual Information
Tomoki Nishide, Kei Shimonishi, Hiroaki Kawashima, Takashi Matsuyama

IP2-05: Forming Intimate Human-Robot Relationships Through A Kissing Machine
Emma Yann Zhang, Adrian David Cheok

IP2-06: Effects of Deformed Embodied Agent During Collaborative Interaction Tasks: Investigation on Subjective Feelings and Emotion
Ayano Kitamura, Yugo Hayashi

IP2-07: Human Posture Detection using H-ELM Body Part and Whole Person Detectors for Human-Robot Interaction
Manoj Ramanathan, Wei Yun Yau, Eam Khwang Teoh

IP2-08: Behavioral Expression Design onto Manufactured Figures
Yoshihisa Ishihara, Kazuki Kobayashi, Seiji Yamada

IP2-09: "I'm Scared": Little Children Reject Robots
Masahiro Shiomi, Kasumi Abe, Yachao Pei, Narumitsu Ikeda, Takayuki Nagai

IP2-10: Towards an Interactive Voice Agent for Singapore Hokkien
Vanessa Lim, Huishan Ang, Estelle Lee, Boon Pang Lim

IP2-11: Effect of Embodiment Presentation by Humanoid Robot on Social Telepresence
Ikkaku Kawaguchi, Yuki Kodama, Hideaki Kuzuoka, Mai Otsuki, Yusuke Suzuki

IP2-12: Ambiguity-Driven Interaction in Robot-to-Human Teaching
Kenta Yamada, Jun Miura

IP2-13: Impression on Human-Robot Communication Affected by Inconsistency in Expected Robot Perception
Kaito Tsukada, Mihoko Niitsuma

IP2-14: Haptic Workspace Control of the Humanoid Robot Arms
Longjiang Zhou, Albertus Hendrawan Adiwahono, Yuanwei Chua, Wei Liang Chan

IP2-15: Attention Estimation for Child-Robot Interaction
Muhammad Attamimi, Masahiro Miyata, Tetsuji Yamada, Takashi Omori, Ryoma Hida

IP2-16: Designing MUSE - A Multimodal User Experience for a Shopping Mall Kiosk
Andreea I. Niculescu, Kheng Hui Yeo, Rafael E. Banchs

Day 4, 7 Oct 2016, Friday

Main Track Session IX (MT9), 09:00 – 10:00
Supporting Work: Studies for Supporting Human Works and Process by Agents. Application Focused Studies

Chair: Andreas Kipp, Co-chair: Yoshimasa Ohmoto

MT9-01: Understanding Behaviours and Roles for Social and Adaptive Robots In Education: Teacher's Perspective
Muneeb Imtiaz Ahmad, Omar Mubin, Joanne Orlando

MT9-02: Evaluation of Schedule Managing Agent among Multiple Members with Representation of Background Negotiations
Tomoko Yonezawa, Kunihiko Fujiwara, Naoto Yoshida

MT9-03: LAP: A Human-in-the-Loop Adaptation Approach for Industrial Robots
Wilson K. H. Ko, Yan Wu, Keng Peng Tee

Main Track Session X (MT10), 11:30 – 12:30
Agents in Real-World: Studies for Supporting Real-World Agents, based Robots

Chair: Tomoko Yonezawa, Co-chair: Luis Fernando D'Haro

MT10-01: A Method to Alternate the Estimation of Global Purposes and Local Objectives to Induce and Maintain the Intentional Stance
Yoshimasa Ohmoto, Takashi Suyama, Toyoaki Nishida

MT10-02: Pedestrian Notification Methods in Autonomous Vehicles for Multi-Class Mobility-on-Demand Service
Evelyn Florentine, Mark Adam Ang, Scott Drew Pendleton, Hans Andersen, Marcelo H. Ang

MT10-03: Estimating Person's Awareness of an Obstacle using HCRF for an Attendant Robot
Kenji Koide, Jun Miura

Interactive Poster Session III (IP3), 10:30—11:30

Chair: Albertus H. Adiwahono, Co-Chair: Britta Wrede

IP3-01: Response Tendencies of Four-Year-Old Children to Communicative and Non-Communicative Robots
Mako Okanda, Yue Zhou, Takayuki Kanda, Hiroshi Ishiguro, Shoji Itakura

IP3-02: Thermal Sweet Taste Machine for Multisensory Internet
Nur Amira Samshir, Nurafiqah Johari, Kasun Karunanayaka, Adrian David Cheok

IP3-03: See Where I am Looking at: Perceiving Gaze Cues With a NAO Robot
Eunice Mwangi, Emilia Barakova, Ruixin Zhang, Marta Diaz, Andreu Catala, Matthias Rauterberg

IP3-04: Promoting Physical Activities by Massive Competition in Virtual Marathon
Yuya Nakanishi, Yasuhiko Kitamura

IP3-05: Development of an Embodied Avatar System using Avatar-Shadow's Color Expressions with an Interaction-activated Communication Model
Yutaka Ishii, Tomio Watanabe, Yoshihiro Sejima

IP3-06: Model-based Reminiscence: Guiding Mental Time Travel by Cognitive Modeling
Junya Morita, Takatsugu Hirayama, Kenji Mase, Kazunori Yamada

IP3-07: Exploring Gaze in Interacting with Everyday Objects with an Interactive Cup
Siti Aisyah binti Anas, Shi Qiu, Matthias Rauterberg, Jun Hu

IP3-08: **ChiCaRo: Tele-presence Robot for Interacting with Babies and Toddlers**
Masahiro Shiomi, Kasumi Abe, Yachao Pei, Tingyi Zhang, Narumitsu Ikeda, Takayuki Nagai

IP3-09: **Mutual Adaptation between a Human and a Robot Based on Timing Control of Sleep-time**
Masahiro Kitagawa, Benjamin Luke Evans, Nagisa Munekata, Tetsuo Ono

IP3-10: **Simulation of a Tele-Operated Task under Human-Robot Shared Control**
Longjiang Zhou, Keng Peng Tee, Zhiyong Huang

IP3-11: **Evaluation of a Substitution Device for Emotional Labor by using Task-Processing Time and Cognitive Load**
Takeomi Goto, Hirotaka Osawa

IP3-12: **A Web-based Platform for Collection of Human-Chatbot Interactions**
Lue Lin, Luis Fernando D'Haro, Rafael Banchs

IP3-13: **The Optimum Rate of Mimicry in Human-Agent Interaction**
Yumiko Shinohara, Katsuhiro Kubo, Momoyo Nozawa, Misa Yoshizaki, Tomomi Takahashi, Hirofumi Hayakawa, Atsushi Hirota, Yukiko Nishizaki, Natsuki Oka

IP3-14: **Smart Mobile Virtual Characters: Video Characters vs. Animated Characters**
Sin-Hwa Kang, Andrew W. Feng, Mike Seymour, Ari Shapiro

Abstracts

Main Track Sessions (I, II, III, IV, V, VI, VII, VIII, IX, X)

MT1-01: Perception of Animacy by the Linear Motion of a Group of Robots

Momoka Nakayama, Shunji Yamanaka

With the advancement of technology, the number of domestic robots used in day-to-day life is expected to increase. We think that it is important for people to perceive animacy in robots in order to develop relationships with them. In this study, we report the proposal and development by our research of a group of five robots shaped like cubes, and equipped with a simple mechanism that allowed them to move in a straight line in order to test certain hypotheses. We showed our group of robots at several exhibitions, where visitors interacted with them. We analyzed how participants' impressions of the robots changed as they began to move. To this end, we used the semantic differential (SD) method in questionnaires. The results revealed that our robot system could convey the impression of being animate to users because of its movement, in spite of its abstract shape and simple mechanism. We also determined that such movement can help improve the relationship between a human user and a robot.

MT1-02: Exploring Social Interaction with Everyday Object based on Perceptual Crossing

Siti Aisyah binti Anas, Shi Qiu, Matthias Rauterberg, Jun Hu

Eye gaze plays an essential role in social interaction which influences our perception of others. It is most likely that we can perceive the existence of another intentional subject through the act of cathing one another's eyes. Based on the notion of perceptual crossing, we aim to establish a meaningful social interaction that emerges out of the perceptual crossing between a person and an everyday object by exploiting the gazing behavior of the person as the input modality for the system. We investigated in literature the experiments that adopt the perceptual crossing as their foundation, lessons learned from literature were used as input for a concept to create meaningful social interaction. We used an eye-tracker to measure gaze behavior that allows the participant to interact with the object by using their eyes through active exploration. It creates a situation where both of them mutually becoming aware of each other's existence. Further, we discuss the motivation for this research, present a preliminary experiment that influences our decision and our directions for future work.

MT1-03: Pre-Scheduled Turn-Taking between Robots to Make Conversation Coherent

Takamasa Iio, Yuichiro Yoshikawa, Hiroshi Ishiguro

Since a talking robot cannot escape from errors in recognizing user's speech in daily environment, its verbal responses are sometimes felt as incoherent with the context of conversation. This paper presents a solution to this problem that generates a social context where a user is guided to find coherency of the robot's utterances, even though its response is produced according to incorrect recognition of user's speech. We designed a novel turn-taking pattern in which two robots behave according to a pre-scheduled scenario to generate such a social context. Two experiments proved that participants who talked to two robots using that turn-taking pattern felt robot's responses to be more coherent than those who talked to one robot not using it; therefore, our proposed turn-taking pattern generated a social context for user's flexible interpretation of robot's responses. This result implies a potential of a multiple robots approach for improving the quality of human-robot conversation.

MT2-01: Do Synchronized Multiple Robots Exert Peer Pressure?

Masahiro Shiomi, Norihiro Hagita

In human-human interaction, peer pressure is a major social influence on people's thoughts, feelings, and behaviors. The larger the group of people, the more social influence it exerts. In this paper, we investigate whether multiple robots and their synchronized behaviors exert peer pressure on people, as in human groups. We developed a multiple robot controller system that enables robots to perform precise synchronization. In the experiment, we prepared a setting that resembled previous experiments that investigated peer pressure between people and robots. The participants answered questions after hearing the robots' answers, only some of which were incorrect. Our experiment results showed that the influence

of the synchronized multiple robots increased the error rates of the participants, but we found no significant effects toward conformity.

MT2-02: NAMIDA: Sociable Driving Agents with Multiparty Conversation

Nihan Karatas, Soshi Yoshikawa, Michio Okada

We propose a multi party conversational social interface NAMIDA through a pilot study. The system consists of three robots that can converse with each other about environment throughout the road. Through this model, the directed utterances towards the driver diminishes by utilizing turn-taking process between the agents, and the mental workload of the driver can be reduced compared to the conventional one-to-one communication based approach that directly addresses the driver. We set up an experiment to compare the both approaches to explore their effects on the workload and attention behaviors of drivers. The results indicated that the multi-party conversational approach has a better effect on reducing certain workload factors. Also, the analysis of attention behaviors of drivers revealed that our method can better promote the drivers to focus on the road.

MT2-03: Are You Talking to Me? Improving the Robustness of Dialogue Systems in a Multi Party HRI Scenario by Incorporating Gaze Direction and Lip Movement of Attendees

Viktor Richter, Birte Carlmeyer, Florian Lier, Sebastian Meyer zu Borgsen, David Schlangen, Franz Kummert, Sven Wachsmuth, Britta Wrede

In this paper, we present our humanoid robot "Meka", participating in a multi party human robot dialogue scenario. Active arbitration of the robot's attention based on multi-modal stimuli is utilised to observe persons which are outside of the robots field of view. We investigate the impact of this attention management and addressee recognition on the robot's capability to distinguish utterances directed at it from communication between humans. Based on the results of a user study, we show that mutual gaze at the end of an utterance, as a means of yielding a turn, is a substantial cue for addressee recognition. Verification of a speaker through the detection of lip movements can be used to further increase precision. Furthermore, we show that even a rather simplistic fusion of gaze and lip movement cues allows a considerable enhancement in addressee estimation, and can be altered to adapt to the requirements of a particular scenario.

MT3-01: Building Trust in PRVAs by User Inner State Transition through Agent State Transition

Tetsuya Matsui, Seiji Yamada

In this research, we aim to suggest a method for designing trustworthy PRVAs (product recommendation virtual agents). We define an agent's trustworthiness as being operated by user emotion and knowledgeableness perceived by humans. Also, we suggest a user inner state transition model for increasing trust. To increase trust, we aim to cause user emotion to transition to positive by using emotional contagion and to cause user knowledgeableness perceived to become higher by increasing an agent's knowledge. We carried out two experiments to inspect this model. In experiment 1, the PRVAs recommended package tours and became highly knowledgeable in the latter half of ten recommendations. In experiment 2, the PRVAs recommended the same package tours and expressed a positive emotion in the latter half. As a result, participants' inner states transitioned as we expected, and it was proved that this model was valuable for PRVA recommendation.

MT3-02: The Use of The BDI Model As Design Principle for A Migratable Agent

Mamoru Yamanouchi, Taichi Sono, Michita Imai

A migratable agent, which has the function of providing an interface between the user and the devices with which it needs to interact, can provide the user with continuous assistance. The relationship established between a human and the agent would enable the user to operate home appliances smoothly. However, few studies which have addressed the primary questions that arise in this regard; for example, how and when the agent should execute the task requested by the user. This paper proposes the use of a design principle based on the BDI model for a migratable agent to ensure that it is capable of carrying out user's tasks appropriately. The BDI model enables the agent to determine the scope of continuing actions to achieve its intended target. The BDI model allows the agent to execute tasks in the clear range of achieving intentions and guarantees the completion of tasks within a reasonable range. We investigated the validity of adopting the BDI model by obtaining feedback via questionnaires related to the design of

the migratable agent. The results of the questionnaires indicated that the BDI model would be able to facilitate the design of the migratable agent.

MT3-03: Conversational Agents and Mental Health: Theory-Informed Assessment of Language and Affect

Adam Miner, Amanda Chow, Sarah Adler, Ilia Zaitsev, Paul Tero, Alison Darcy, Andreas Paepcke

A study deployed the mental health Relational Frame Theory as grounding for an analysis of sentiment dynamics in human-language dialogs. The work takes a step towards enabling use of conversational agents in mental health settings. Sentiment tendencies and mirroring behaviors in 11k human-human dialogs were compared with behaviors when humans interacted with conversational agents in a similar-sized collection. The study finds that human sentiment-related interaction norms persist in human-agent dialogs, but that humans are twice as likely to respond negatively when faced with a negative utterance by a robot than in a comparable situation with humans. Similarly, inhibition towards use of obscenity is greatly reduced. We introduce a new Affective Neural Net implementation that specializes in analyzing sentiment in real time.

MT4-01: Improving Smartphone Users' Affect and Wellbeing with Personalized Positive Psychology Interventions

Sooyeon Jeong, Cynthia Lynn Breazeal

We developed a smartphone application that detects users' affect and provides personalized positive psychology interventions in order to enhance users' psychological wellbeing. Users' emotional states were measured by analyzing facial expressions and the sentiment of SMS messages. A virtual character in the application prompted users to verbally journal about their day by providing three positive psychology interventions. The system used a Markov Decision Process (MDP) model and a State-Action-Reward-State-Action (SARSA) algorithm to learn users' preferences about the positive psychology interventions. Nine participants were recruited for an experimental study to test the application. They used it daily for three weeks. The interactive journaling activity increased participants' arousal and valence levels immediately following each interaction, and we saw a trend toward improved self-acceptance levels over the three week period. The interaction duration increased significantly throughout the study as well. The qualitative analysis on journal entries showed that the application users explored and reflected on various aspects of themselves by looking at daily events, and found novel appreciation for and meanings in their daily routine.

MT4-02: Investigating Breathing Expression of a Stuffed-Toy Robot Based on Body-Emotion Model

Naoto Yoshida, Tomoko Yonezawa

In this research, we focus on physiological phenomena expression of robots, propose the Body-Emotion Model (BEM), which concerns the relationship between the internal states of robots and their involuntary physical reactions. We expect that the robot will be able to express the delicate nuances of its intention by controlling robots' emotions and feelings with each individual parameter based on BEM. We propose a stuffed-toy robot system, BREAR, which has a mechanical structure to express breathing, heartbeating, temperature, and bodily movement. The breathing mechanism commonly controls the abdominal motion, breathing motion, and air flows of breath. In this paper, we focus on robot's breathing, verify two subjective evaluations: 1) the user's sense that the robot was alive and 2) the perceived states of the robot based on its breathing speed. The results showed that our proposed method of breathing expression can show a state of living and that the breathing speed was interpreted as the robot's emotion of arousal.

MT4-03: Sharing Emotion described as text on the Internet by changing self-physiological perception

Sho Sakurai, Yuki Ban, Toki Katsumura, Takuji Narumi, Tomohiro Tanikawa, Michitaka Hirose

Agents like human, such as humanoid robots or avatars can be felt as if they have and communicate and communicate due to manipulation of the bodily information. Meanwhile, as in the case of Internet bot, it is still difficult to communi-cate the emotion described as text, let alone empathizing due to degradation of information online. The current study proposes a method for experiencing emotion on the Internet by reproducing a mechanism of evoking emotion. This method evokes a number of emotions described on

the Web, by changing of self-physiological perception with sensory stimuli. To investigate the feasibility of our method, we made a system named Communious Mouse. This system rewrites the perception of self-skin temperature and pulse in a palm by presenting vibration and thermal stimulation through a mouse device for evoking emotion. The current paper discusses the feasibility of our method based on the obtained feedbacks through an exhibition of the system.

MT5-01: Synthesizing Realistic Image-based Avatars by Body Sway Analysis

Masashi Nishiyama, Tsubasa Miyauchi, Hiroki Yoshimura, Yoshio Iwai

We propose a method for synthesizing body sway to give human-like movement to image-based avatars. This method is based on an analysis of body sway in real people. Existing methods mainly handle the action states of avatars without sufficiently considering the wait states that exist between them. The wait state is essential for filling the periods before and after interaction. Users require both wait and action states to naturally communicate with avatars in interactive systems. Our method measures temporal changes in the body sway motion of each body part of a standing subject using a single-camera video sequence. We are able to synthesize a new video sequence with body sway over an arbitrary length of time by randomly transitioning between points in the sequence when the motion is close to zero. The results of a subjective assessment show that avatars with body sway synthesized by our method appeared more alive to users than those using baseline methods.

MT5-02: Who am I Touching ?: User Study of Remote Handshaking with a Telepresence Face

Kana Misawa, Jun Rekimoto

In mediated communications, the social presence is said to be enhanced not only by eye contact and body gestures but also by remote haptics. To realize remote haptics, we present a mask telepresence system worn by a surrogate that displays the face of a remote user through a livestream. This system allows someone to shake the hand of a remote user via the surrogate. We conducted experiments where the surrogate contacted the participants to determine with whom the participants thought they shook hands: the surrogate or the remote user. We hy- pothesized that the relationship between the participant and surrogate or remote user is affected by the haptic sensations. Therefore, we prepared four conditions where the remote user was an acquaintance or a stranger and the surrogate was an acquaintance or a stranger. The results showed that, when the surrogate and the remote user were acquaintances, the participants felt like they were shaking hands with the remote user.

MT5-03: Embodiment of Video-mediated Communication Enhances Social Telepresence

Yuya Onishi, Kazuaki Tanaka, Hideyuki Nakanishi

There are several merits to embody the remote partner's body to the video conference: showing it physically, making a physical contact, and enhancing social telepresence. In this paper, we tackled to embody a part of a remote partner's body in a video conference. As a method to show how effectively the embodied body part works, we focused on face-to-face communication of the hand gestures such as thumb wrestling, finger number game and pointing. We developed a robotic arm, which seems the remote partner's arm popped out from the video. Our robot arm synchronizes with the remote partner's arm movements. We conducted experiments to verify the method of embodying a part of a remote partner's body. We found that, our method reduced the feeling of being far from the remote partner, and enhanced social telepresence, comparing video and physical embodiment.

MT6-01: Investigating Effects of Professional Status and Ethnicity in Human-Agent Interaction

Mohammad Obaid, Maha Salem, Micheline Ziadee, Halim Boukaram, Elena Moltchanova, Majd Sakr

We present a study involving 160 participants investigating the effect of associating professional status and ethnicity with an agent by manipulating its appearance, language, and level of education. We aim to discern perceptions of status and ethnicity with respect to participants' cultural background by inviting participants from two different cultural groups (Middle Eastern and Western) to take part in our study. Results revealed that participants' cultural background had a strong impact on their ratings of the agent and its message. However, neither the agent's portrayed status nor its ethnicity appeared to have an effect on participants' perceptions of the agent. We further found that participants from both cultural backgrounds holding a negative attitude towards robots in general tend to perceive the presented message by the agent more negatively. Middle Eastern participants had a more positive attitude towards robotic agents than Western participants, which might have been the main influence on their perception of the

message presented by the agent. In addition, participants who identified the agent as a member of their own cultural group perceived the presented message more positively than those from the other cultural group. We discuss our results with an intention to inform design implications for agents in a cross-cultural context.

MT6-02: Does a Conversational Robot Need to Have its own Values? A Study of Dialogue Strategy to Enhance People's Motivation to Use Autonomous Conversational Robots

Takahisa Uchida, Takashi Minato, Hiroshi Ishiguro

This work studies a dialogue strategy aimed at building people's motivation for talking with autonomous conversational robots. Even though spoken dialogue systems continue to develop rapidly, the existing systems are insufficient for continuous use because they fail to motivate users to talk with them. One reason is that users fail to realize that the intentions of the system's utterances are based on its values. Since people recognize the values of others and modify their own values in human-human conversations, we hypothesize that a dialogue strategy that makes users saliently feel the difference of their own values and those of the system will increase motivation for the dialogues. Our experiment, which evaluated human-human dialogues, supported our hypothesis. However, an experiment with human-android dialogues failed to produce identical results, suggesting that people did not attribute values to our android. For a conversational robot, we need additional techniques to convince people to believe a robot speaks based on its own values and opinions.

MT7-01: Alignment Approach Comparison between Implicit and Explicit at Object Reference Conversation

Mitsuhiko Kimoto, Takamasa Iio, Masahiro Shiomi, Ivan Tanev, Katsunori Shimohara, Norihiro Hagita

The recognition of an indicated object by an interacting person is an essential function for a robot that acts in daily environments. To improve recognition accuracy, clarifying the goal of the indicating behaviors is needed. For this purpose, we experimentally compared two kinds of interaction strategies: a robot that explicitly provides instructions to people about how to refer to objects or a robot that implicitly aligns with the people's indicating behaviors. Even though our results showed that participants evaluated the implicit approach to be more natural than the explicit approach, the recognition performances of the two approaches were not significantly different.

MT7-02: Communication Cues in a Human-Robot Touch Interaction

Takahiro Hirano, Masahiro Shiomi, Takamasa Iio, Mitsuhiko Kimoto, Takuya Nagashio, Ivan Tanev, Katsunori Shimohara, Norihiro Hagita

Haptic interaction is a key capability for social robots that closely interact with people in daily environments. Such human communication cues as gaze behaviors make haptic interaction look natural. Since the purpose of this study is to increase human-robot touch interaction, we conducted an experiment with 20 participants who interacted with a robot with different combinations of gaze behaviors and touch styles. The experimental results showed that both gaze behaviors and touch styles influence the changes in the perceived feelings of touch interaction with a robot.

MT7-03: Humotion -- A human inspired gaze control framework for anthropomorphic robot heads

Simon Schulz, Florian Lier, Andreas Kipp, Sven Wachsmuth

In recent years, an attempt is being made to control robots more intuitive and intelligible by exploiting and integrating anthropomorphic features to boost social human-robot interaction. The design and construction of anthropomorphic robots for this kind of interaction is not the only challenging issue -- smooth and expectation-matching motion control is still an unsolved topic. In this work we present a highly configurable, portable, and open control framework that facilitates anthropomorphic motion generation for humanoid robot heads by enhancing state-of-the-art neck-eye coordination with human-like eyelid saccades and animation. On top of that, the presented framework supports dynamic neck offset angles that allow animation overlays and changes in alignment to the robots communication partner whileretaining visual focus on a given target. In order to demonstrate the universal applicability of the proposed ideas we used this framework to control the Flobi and the iCub robot head, both in simulation

and on the physical robot. In order to foster further comparative studies of different robot heads, we will release all software, based on this contribution, under an open-source license.

MT8-01: A Leader-Follower Relation between a Human and an Agent

Kazunori Terada, Seiji Yamada, Kazuyuki Takahashi

The purpose of this work is to investigate which of an agent's properties determines leader-follower relationships in cooperative tasks performed by a human and an agent (a computer). The possible factors of an agent are intelligence, obstinance, and appearance. In this paper, we focused on intelligence and obstinance and conducted a psychological experiment using a mark matching game with a declaration phase, which enables us to observe who becomes the leader in a cooperative task. Experimental results showed that humans tend to follow an agent who has low intelligence and more obstinance rather than an agent who has high intelligence and less obstinance, and we found that obstinance is more important than intelligence in being a leader in human-computer interaction.

MT8-02: "I Know How You Performed!" - Fostering Engagement in a Gaming Situation Using Memory of Past Interactions

Andreas Kipp, Franz Kummert

Studying long-term human-robot interactions in the context of playing games can help answer many questions about how humans perceive robots. This paper presents the results of a study where the robot Flobi plays a game of pairs against a human player and employs a memory with information about past interactions. The study focuses on long-term effects, namely the novelty effect, and how a memory with statistics about past game-plays can be used to cope with that effect. We also investigate how an autonomous interaction compares to a remotely controlled system that plays flawlessly. Results showed that providing information about how players performed throughout the interaction can help to keep them more interested and engaged. Nevertheless, results also showed that this information in combination with perfect playing skills tended to promote a more negative perception of the interaction and of the robot.

MT8-03: Children's Facial Expressions in Truthful and Deceptive Interactions with a Virtual Agent

Mariana Serras Pereira, Jolanda de Lange, Suleman Shahid, Marc Swerts

The present study focused on the facial expressions that children exhibit while they try to deceive a virtual agent. An interactive lie elicitation game was developed to record children's facial expressions during deceptive and truthful utterances, when doing the task alone or in the presence of peers. Based on manual annotations of their facial expressions, we found that children, while communicating with a virtual agent, produce different facial expressions in deceptive and truthful contexts. It seems that deceptive children try to cover their lie as they smile significantly more than truthful children. Moreover, co-presence enhances children's facial expressive behaviour and the amount of cues to deceit. Deceivers, especially when being together with a friend, more often press their lips, smile, blink and avert their gaze than truth-tellers.

MT9-01: Understanding Behaviours and Roles for Social and Adaptive Robots In Education: Teacher's Perspective

Muneeb Imtiaz Ahmad, Omar Mubin, Joanne Orlando

In order to establish a long-term relationship between a robot and a child, robots need to learn from the environment, adapt to specific user needs and display behaviours and roles accordingly. Literature shows that certain robot behaviours could negatively impact child's learning and performance. Therefore, the purpose of the present study is to not only understand teacher's opinion on the existing effective social behaviours and roles but also to understand novel behaviours that can positively influence children performance in a language learning setting. In this paper, we present our results based on interviews conducted with 8 language teachers to get their opinion on how a robot can efficiently perform behaviour adaptation to influence learning and achieve long-term engagement. We also present results on future directions extracted from the interviews with teachers..

MT9-02: Evaluation of Schedule Managing Agent among Multiple Members with Representation of Background Negotiations

Tomoko Yonezawa, Kunihiko Fujiwara, Naoto Yoshida

This paper proposes an interactive manager agent system that adjusts schedule among multiple persons through negotiations on behalf of a human organizer, such as a steward or team manager. In order to increase the users' cooperative decision-making, we implemented the manager agent that negotiates with each member on the schedule using 1) the suitable attitude depending on current situation and partner of negotiation and 2) the graphical representation of background negotiations between the agent and the other users: a) the other users' icons, b) the blinking balloons of both the other users and the agent, and c) the agent's looking-back actions for the other users' icons. The results of the evaluations showed that both the individual use and the combination of the proposed expressions could make the participants feel i) as though there were under-going negotiations between the agent and the other users and ii) as though the agent had both the effort and compassion to the user. Moreover, the user's cooperative decision-making was increased by the proposed method.

MT9-03: LAP: A Human-in-the-loop Adaptation Approach for Industrial Robots

Wilson K. H. Ko, Yan Wu, Keng Peng Tee

In the last few years, a shift from mass production to mass customisation is observed in the industry. Easily reprogrammable robots that can perform a wide variety of tasks are desired to keep up with the trend of mass customisation while saving costs and development time. Learning by Demonstration (LfD) is an easy way to program the robots in an intuitive manner and provides a solution to this problem. In this work, we discuss and evaluate LAP, a three-stage LfD method that conforms to the criteria for the high-mix-low-volume (HMLV) industrial settings. The algorithm learns a trajectory in the task space after which small segments can be adapted on-the-fly by using a human-in-the-loop approach. The human operator acts as a high-level adaptation, correction and evaluation mechanism to guide the robot. This way, no sensors or complex feedback algorithms are needed to improve robot behaviour, so errors and inaccuracies induced by these subsystems are avoided. After the system performs at a satisfactory level after the adaptation, the operator will be removed from the loop. The robot will then proceed in a feed-forward fashion to optimise for speed. We demonstrate this method by simulating an industrial painting application. A KUKA LBR iiwa is taught how to draw an eight figure which is reshaped by the operator during adaptation.

MT10-01: A Method to Alternate the Estimation of Global Purposes and Local Objectives to Induce and Maintain the Intentional Stance

Yoshimasa Ohmoto, Takashi Suyama, Toyoaki Nishida

The virtual world simulation has many advantages. However, the effects of the experience strongly influence the mental stance of the participants. To establish social relationships between a human and an artificial agent, the agent has to induce and maintain the intentional stance in its human partner. The purpose of this study was to investigate the method to induce the intentional stance in human participants of one-to-one human-agent interaction by using the alternating estimation of local objectives and global purposes by a network-connected two-layer model. We conducted an experiment to evaluate effect of the proposed method. The results suggested that this method was successful in inducing and maintaining the intentional stance over time.

MT10-02: Pedestrian Notification Methods in Autonomous Vehicles for Multi-Class Mobility-on-Demand Service

Evelyn Florentine, Mark Adam Ang, Scott Drew Pendleton, Hans Andersen, Marcelo H. Ang

In this paper, we describe methods of conveying perception information and motion intention from self driving vehicles to the surrounding environment. One method is by equipping autonomous vehicles with Light-Emitting Diode (LED) strips to convey perception information; typical pedestrian-driver acknowledgement is replaced by visual feedback via lights which change color to signal the presence of obstacles in the surrounding environment. Another method is by broadcasting audio cues of the vehicle's motion intention to the environment. The performance of the autonomous vehicles as social robots is improved by building trust and engagement with interacting pedestrians. The software and hardware systems are detailed, and a video demonstrates the working system in real application. Further extension of the work for multi-class mobility in human environments is discussed.

MT10-03: Estimating Person's Awareness of an Obstacle using HCRF for an Attendant Robot

Kenji Koide, Jun Miura

This paper describes an estimation method of a person's awareness of an obstacle. We assume that the person's awareness influences the person's motion, and construct a model of the relationship between the awareness and the motion using HCRF. We extract a sequence of motion features from the person trajectory, and then classify whether the person is aware of the obstacle or not using the model. Awareness estimation experiments are conducted in order to validate the method and evaluate its performance. Since the method uses only the position and the velocity of the person, it can be applicable to mobile robots.

Interactive Poster Sessions (I, II, III)

IP1-01: Visual Tracking of Human Gestures under Field-of-View Constraints

Keng Peng Tee, Yuanwei Chua, Zhiyong Huang

This paper presents a control design for a desktop telepresence robot that guarantees satisfaction of field-of-view (FOV) constraints when dynamically tracking multiple points of interest on a person. The multi-point tracking problem is solved by complementing centroid tracking with local constraint satisfaction that is achieved by local integral barrier functions active only in small regions near the FOV limits. Such a control provides an aggregate view of the points of interest on the person and ensures that none of them goes out of view. A simulation study illustrates the performance of the proposed control in comparison with a conventional control.

IP1-02: Whispering Bubbles: Exploring Anthropomorphism through Shape-Changing Interfaces

Shi Qiu, Siti Aisyah Anas, Jun Hu

In anthropomorphic design, there has been increasing interests in using kinetic motion and shape changing of the physical objects as a medium to communicate with people. In this paper, we introduce an interactive installation named Whispering Bubbles to explore anthropomorphism through shape-changing interfaces embedded in a physical space. It aims to provide a poetic place for people to whisper with the organically shaped objects (bubbles), to help people release mental stress in their modern lives. When a person approaches bubbles within a given distance, slight up-and-down movements of the bubbles will be activated by infrared sensors embedded in the space; when a person stands nearby a bubble and whispers to it, the bubble will hear with its sound detector and be triggered to bend towards the person, indicating engagement in listening. A scale model is implemented to explore and demonstrate interactions.

IP1-03: Model-Driven Gaze Simulation for the Blind Person in Face-to-Face Communication

Shi Qiu, Siti Aisyah Anas, Hirotaka Osawa, Matthias Rauterberg, Jun Hu

In face-to-face communication, eye gaze is integral to a conversation to supplement verbal language. The sighted often uses eye gaze to convey nonverbal information in social interactions, which a blind conversation partner cannot access and react to them. In this paper, we present E-Gaze glasses (E-Gaze), an assistive device based on an eye tracking system. It simulates gaze for the blind person to react and engage the sighted in face-to-face conversations. It is designed based on a model that combines eye-contact mechanism and turn-taking strategy. We further propose an experimental design to test the E-Gaze and hypothesize that the model-driven gaze simulation can enhance the conversation quality between the sighted and the blind person in face-to-face communication.

IP1-04: Investigation of Practical Use of Humanoid Robots in Elderly Care Centres

Zhuoyu Shen, Yan Wu

The global trend of population ageing has magnified the shortage of qualified staff in the elderly care industry. This study evaluates the feasibility and user experience of introducing robots in elderly care services. A robot instructor was being benchmarked against a human instructor administering two types of activities with 41 elderly participants. The results show that robot was more effective and better preferred by users over human instructor on instructing physical exercise, while reaching similar level of effectiveness and user acceptance on information delivery. Additionally, user perception of robots improved after the robot experiment session. These findings could be useful for future design of robots for elderly users and for social robots in general.

IP1-05: User Generated Agent: Designable Book Recommendation Robot Programmed by Children

Yusuke Kudo, Wataru Kayano, Takuya Sato, Hirotaka Osawa

School libraries are required to promote the habit of reading books in elementary school children. It is necessary to cultivate children's interest in books to achieve this goal. In this paper, we propose a user-generated agent (UGA) that introduces books. Elementary school children can program the behavior of the UGA themselves. The UGA not only cultivates the children's interest in the book introduced by the

agent, but also their motivation for the presentation by allowing them to design the contents of the agent. We promote the habit of reading by allowing the children to modify the agent's design and giving them the opportunity to refine their ability to promote books.

IP1-06: Cross-Cultural Study of Perception and Acceptance of Japanese Self-adaptors

Takuto Ishioh, Tomoko Koda

This paper reports our preliminary results of a cross-cultural study of perception and acceptance of cultural specific self-adaptors performed by a virtual agent. There are culturally-defined preferences in self-adaptors and other bodily expressions, and allowance level of expressing such non-verbal behavior are culture-dependent. We conducted a web experiment to evaluate the impression and acceptance of Japanese culture specific self-adaptors and gathered participants from 8 countries. The results indicated non-Japanese participants' insensitivity to the different types of self-adaptors and over sensitivity to Japanese participants' to stressful self-adaptors.

IP1-07: Modulating Dynamic Models for Lip Motion Generation

Singo Sawa, Hiroaki Kawashima, Kei Shimonishi, Takashi Matsuyama

Generation of natural human motion is one of key techniques for multimodal dialogue systems with a human-like avatar. In particular, natural and expressive lip motion synthesis is necessary to make conversation between a user and an avatar richer. However, such expressive lip motion is often difficult to be generated automatically because it can be changed depending on phonemic context and prosody. To address this difficulty, we introduce a novel motion generation method on the basis of the modulation of a set of dynamic models learned from neutral motion data. As a suitable model for lip motion generation, we adopt a hybrid dynamical system, which consists of linear dynamical systems for each motion unit and a symbolic automaton for switching between these units. We show that, from the viewpoint of control theory, it is possible to modulate linear dynamical systems for various types of motion. Early results demonstrate the applicability of the proposed method using lip motion synthesis for simple phoneme sequences.

IP1-08: Magnetic Dining Table Interface and Magnetic Foods for New Human Food Interactions

Nur Ellyza Abd Rahman, Azhri Azhar, Kasun Karunanayaka, Adrian David Cheok, Mohammad Abdullah Mohamad Johar, Jade Gross, Andoni Luis Aduriz

This poster paper discuss the concept of magnetic table interface and magnetic foods. This interface introduces new human-food interactions such as modifying weight, levitation, movement, and dynamic textures for our daily used food and utensils using a strong magnetic field formed by an array of Bitter electromagnets. To make foods and cutleries interactive, we add edible magnetic material on the food such as iron and iron oxides, and make cutleries with magnetic materials. We expect that this system will alter our food consumption behaviours and make the whole experience much more interactive and enjoyable.

IP1-09: A Study on Trust in Pharmacists for Better HAI Design

Jia Qi Lim, Nicole Sze Ting Lim, Maya Zheng, Swee Lan See

Trust is a fundamental element in human cooperation and a critical factor in determining the success of human-human communications. This paper investigates trust in pharmacists and their customers and provides an insight into how trust is being established to effect human-human and human-agent interactions (HAI), in order to promote better design of robotic agents, such as a robot pharmacy-advisor, in support of the healthcare industry.

IP1-10: Development of a Simulated Environment for Recruitment Examination and Training of High School Teachers

Masato Fukuda, Hung-Hsuan Huang, Tetsuya Kanno, Naoki Ohta, Kazuhiro Kuwabara

While the environment of schools become more and more complicated, the improvement of teachers' skills in teaching and management is required. In this study, we focus on the development of a Wizard-of-Oz (WOZ) platform of simulated school environment, which can be utilized for teacher training or the examination of teacher recruitment from remote. This system is comprised of two front ends, one is a simulated classroom for the trainee, the other one is the interface for the system operator / investigator.

The virtual classroom contains a number of virtual students who are controlled by the operator from the remote. The operator can observe the trainee from a dedicated interface and control the behaviors of any individual student as well as the atmosphere of the whole class. The whole-class atmosphere created by relatively large number of students is modeled as a concentration-arousal two dimensional space. The prototype system is evaluated with subject experiment and the results are reported.

IP1-11: Ex-Amp Robot: Physical Avatar for Enhancing Human to Human Communication

Ai Kashii, Kazunori Takashio, Hideyuki Tokuda

Our research focuses on creating a robotic system that aids human-to-human communication. The robot acts as a personal companion that understands the user's emotions and helps express them alongside the user. First, the user's facial expression is detected through a connected camera device and relays the retrieved information to a humanoid robot. The humanoid robot then performs physical gestures that match the detected emotion. By using this system, those who are unable to freely move their own bodies can add a physical component to their communication method. In this paper, we have determined the efficacy of translating detected facial expressions into robot movements. Through experiments and surveys, we determined whether our proposed Ex-Amp Robot helped enhance the communication of a hypothetically tetraplegic user.

IP1-12: Interaction in a Natural Environment: Estimation of Customer's Preference Based on Nonverbal Behaviors

Hidehito Honda, Ryosuke Hisamatsu, Yoshimasa Ohmoto, Kazuhiro Ueda

We examined the interaction in face-to-face selling situation. In particular, we examined how customer's nonverbal behaviors were related to their preference in a natural environment. We found that customers' body posture could be a good predictor about their preference. We also found that estimation on customer's preference could be achieved from two nonverbal behaviors better than single behavior. We discuss the present contributions toward constructing the efficient agent systems.

IP1-13: Ear Ball for Empathy: To Realize the Sensory Experience of People with Autism Spectrum Disorder

Taisuke Murakami

Autism spectrum disorder (ASD) are characterized by difficulties in sensory integration and a body image which differs from the normal, healthy one. In order to enable healthy people to experience and thus develop a deeper understanding of the different body image that people with developmental disorders possess the author is pursuing research into the simulation of sensory experiences common to ASD. This study focuses on a particular sensory characteristic of ASD where difficulty is experienced in locating the source of sound in an environment and the development of a device for simulating the sense of hearing experienced in such a disorder. Workshops for children were carried out using the developed device, with interviews indicating that the majority of participants experienced feelings of ambiguity in relation to their own senses. Such a feeling in one's sensory boundaries is a phenomenon which is common in ASD research. It was concluded that the device developed in this study allowed people to vicariously experience the senses of people with ASD.

IP1-14: Process of Agency Identification Based on the Desire to Communicate in Embodied Interaction

Takafumi Sakamoto, Yugo Takeuchi

Humans can communicate because they adapt and adjust their behavior to each other. We hypothesize that developing a relationship with others requires coordinating the desire to communicate and that this coordination is related to agency identification. To model this initial phase of communication, we created an experimental environment to observe the interaction between a human and an abstract-shaped robot whose behavior, moving on the floor and rotating, was mapped by another human. The participants were required to verbalize what they were thinking or feeling while interacting with the robot. At present, we do not have a sufficient number of participants, and experiments and data analysis are ongoing. We must verify the effects of interaction patterns and inspect what type of action and reaction are regarded as signals that enhance interpersonal interaction.

IP1-15: Can Children Anthropomorphize Human-shaped Communication Media?: A Pilot Study on Co-Sleeping with a Huggable Communication Medium

Junya Nakanishi, Hidenobu Sumioka, Hiroshi Ishiguro

This pilot study reports an experiment where we introduced huggable communication media into daytime sleep in co-sleeping situation. The purpose of the experiment was to investigate whether it would improve soothing child users' sleep and how hugging experience with anthropomorphic communication media affects child's anthropomorphic impression on the media in co-sleeping. In the experiment, nursery teachers read two-year-old or five-year-old children to sleep through huggable communication media called Hugvie and asked the children to draw Hugvie before and after the reading to evaluate changes in their impressions of Hugvie. The results show the difference of sleeping behavior with and the impressions on Hugvie between the two classes. Moreover, they also showed the possibility that co-sleeping with a humanlike communication medium induces children to sleep deeply.

IP1-16: A Multimodal Control Architecture for Autonomous Unmanned Aerial Vehicles

Marco Antonio Gutierrez, Luis Fernando D'Haro, Rafael Enrique Banchs

We present our preliminary work on a multimodal control architecture that enables an operator to manage an autonomous Unmanned Aerial Vehicle (UAV) through high level tasks in an indoors environment. The intelligence embedded in our architecture is able to decode these tasks into low level instructions that a UAV is able to execute. Our system allows the user to operate the UAV through speech, text or keyboard/mouse input, all presented in a web based graphical user interface that can be accessed from any Internet powered device.

IP2-01: Human-Robot Cooperative Conveyance Using Speech and Head Gaze

Tetsushi Oka, Sho Uchino

In this study, we designed a strategy using speech and head gaze and a set of voice commands for cooperative conveyance by a human and a robot. In the designed strategy, the human turns his or her head to face the robot and gives one of twelve spoken commands in the set. In order to start and stop the robot moving, the human sends nonverbal cues by changing his or her point of gaze. We developed a mobile robot that interacts with a human based on the strategy and the command set, which was evaluated with ten young novices. The results of this study imply that most young people can quickly learn how to cooperate with our robot to move objects using speech and head gaze.

IP2-02: "Look at Me!" -- Self-Interruptions as Attention Booster?

Birte Carlmeyer, David Schlangen, Britta Wrede

In this paper we present results of an exploratory experiment investigating the effects of a contingently self-interrupting vs non-self-interrupting virtual agent who transmits information to a human interaction partner. In the experimental condition self-interruptions of the agent were triggered by an external event whereas in the control group the agent did not react to this event. We measured the effect of the agent's self-interruptions on human attention, memory performance and subjective ratings. In this paper we discuss the results with respect to the design of incremental human-agent dialogue modeling.

IP2-03: Investigation on Effects of Color, Sound, and Vibration on Human's Emotional Perception

Sichao Song, Seiji Yamada

As robotics has advanced, research on conveying a robot's emotional state to a person has become a hot topic. Most current studies are focused on interaction modalities such as facial expressions and natural language. Although many of the results seem to be promising, they suffer from high cost and technical difficulties. In this paper, we turn our attention to three other interaction modalities: color, sound, and vibration. Such modalities have the advantage of being simple, low cost, and intuitive. We conducted a pilot study to evaluate the effects of the three modalities on a human's emotional perception towards our robot Maru. Our result indicates that humans tend to interpret a robot's emotion as negative (angry in particular) when vibration and sound are used, while they interpret the emotion as relaxed when only color modality is used. In addition, the participants showed preference towards the robot when using all three modalities.

IP2-04: Voting-Based Backchannel Timing Prediction Using Audio-Visual Information

Tomoki Nishide, Kei Shimonishi, Hiroaki Kawashima, Takashi Matsuyama

While many spoken dialog systems are recently developed, users need to summarize and convey what they want the system to do clearly. However, in a human dialog, a speaker often summarize what to say incrementally, provided that there is a good listener who responds to the speaker's utterances at appropriate timing. We consider that generating backchannel responses, where appropriate, overlapped with the user's utterances is crucial for an artificial listener system that can promote user's utterances since such overlaps are the norm in human dialogs. Toward the goal to realize such a listener system, in this paper, we propose a voting-based algorithm of predicting the end of utterances early (i.e., before the utterances end) using audio-visual information. In the evaluation, we demonstrate the effectiveness of using audio-visual information and the applicability of the voting-based prediction algorithm with some early results.

IP2-05: Forming Intimate Human-Robot Relationships Through A Kissing Machine

Emma Yann Zhang, Adrian David Cheok

Robots are increasingly becoming involved in people's lives as social companions or even romantic partners rather than mere productivity tools. To facilitate intimacy in human-robot relationships, technologies should enable human to have intimate physical interactions with robots, such as kissing. This paper presents a kissing machine that reproduces and transmits the haptic sensations of kissing. It provides a physical interface for human to form emotional and intimate connections with robots or virtual characters through kissing, and also acts as a remote agent for human to transmit kisses remotely through a communication network.

IP2-06: Effects of Deformed Embodied Agent during Collaborative Interaction Tasks: Investigation on Subjective Feelings and Emotion

Ayano Kitamura, Yugo Hayashi

Designing embodied agents that are empathic and positive towards humans is important in Human Agent Interaction (HAI) and design factors need to be instigated based on experimental investigation. Agent design specificity, in which less specific animated designs are better than realistic designs, is one of the key factors that facilitate positive emotions during interactions. Focusing on this point, this study investigated the effects of a deformed embodied agent during a collaborative interaction task with the objective of understanding how subjective interpersonal states and emotional states change when deformed embodied agents are used instead of non-deformed agents. This was accomplished by developing an interactive communication task with the embodied agent and collecting subjective and emotional state data during the task. The results obtained indicate that deformed agents evoke impressions of closeness and produce higher arousal states.

IP2-07: Human Posture Detection using H-ELM Body Part and Whole Person Detectors for Human-Robot Interaction

Manoj Ramanathan, Wei Yun Yau, Eam Khwang Teoh

For reliable human-robot interaction, the robot must know the person's action in order to plan the appropriate way to interact or assist the person. As part of the pre-processing stage of action recognition, the robot also needs to recognize the various body parts and posture of the person. But estimation of posture and body parts is challenging due to the articulated nature of the human body and the huge intra-class variations. To address this challenge, we propose two schemes using Hierarchical-ELM (H-ELM) for posture detection into either upright or non-upright posture. In the first scheme, we follow a whole body detector approach, where a H-ELM classifier is trained on several whole body postures. In the second scheme, we follow a body part detection approach, where separate H-ELM classifiers are detected for each body part. Using the detected body parts a final decision is made on the posture of the person. We have conducted several experiments to compare the performance of both approaches under different scenarios like view angle changes, occlusion etc. Our experimental results show that body part H-ELM based posture detection works better than other proposed framework even in the presence of occlusion.

IP2-08: Behavioral Expression Design onto Manufactured Figures

Yoshihisa Ishihara, Kazuki Kobayashi, Seiji Yamada

Natural language user interfaces, such as Apple Siri and Google Voice Search have been embedded in consumer devices; however, speaking to objects can feel awkward. Use of these interfaces should feel natural, like speaking to a real listener. This paper proposes a method for manufactured objects such as anime figures to exhibit highly realistic behavioral expressions to improve speech interaction between a user and an object. Using a projection mapping technique, an anime figure provides back-channel feedback to a user by appearing to nod or shake its head.

IP2-09: "I'm Scared": Little Children Reject Robots

Masahiro Shiomi, Kasumi Abe, Yachao Pei, Narumitsu Ikeda, Takayuki Nagai

Social robots are used for interacting with children. Their novelty often stimulates the interest of children and encourages such interaction as playing with them. However, some children do not interact with such robots and instead strongly reject interaction with them. Understanding such rejection behaviors of children has important design implications for social robots that are supposed to interact with children. For this purpose, we investigated what kinds of rejection behaviors appeared in different kinds of robots in a play room environment.

IP2-10: Towards an Interactive Voice Agent for Singapore Hokkien

Vanessa Lim, Huishan Ang, Estelle Lee, Boon Pang Lim

Singapore Hokkien (SH) is the most commonly spoken non-Mandarin Chinese dialect in Singapore. It is an important language for many members of Singapore's pioneer generation, but much less so for the younger generation who prefer English. In recent years, the greying of this demographic has placed an increasing demand on for assistive devices to support them. We report ongoing efforts to build limited-vocabulary speech recognition, with the eventual goal of a conversational voice agent in SH that can support applications in home-automation or in-hospital use case scenarios. This process is challenging as sizeable SH speech corpora do not yet exist, and SH is sufficiently different from existing Mandarin or Minnan such that other corpora cannot be directly used. We document our efforts at building language resources -- audio corpora, pronunciation lexicons -- and present some preliminary findings on multilingual training.

IP2-11: Effect of Embodiment Presentation by Humanoid Robot on Social Telepresence

Ikkaku Kawaguchi, Yuki Kodama, Hideaki Kuzuoka, Mai Otsuki, Yusuke Suzuki

In this study, we used a humanoid robot as a telepresence robot and compared with the basic telepresence robot which can only rotate the display in order to reveal the effect of embodiment. We also investigated the effect caused by changing the body size of the humanoid robot by using two different size of robots. Our experimental results revealed that the embodiment increases the remote person's social telepresence, familiarity, and directivity. The comparison between small and big humanoid robots showed no difference and both of them were effective.

IP2-12: Ambiguity-Driven Interaction in Robot-to-Human Teaching

Kenta Yamada, Jun Miura

The transfer of task knowledge is ubiquitous in our daily lives, where various types of interaction occur. Such an interactive task knowledge transfer, however, requires that an instructor and a learner to be at the same place and time. If we use a robot to mediate between them, such limitations can be eliminated. This paper focuses on human-to-robot teaching, in which a robot instructor interactively teaches a human learner how to achieve a task. We develop an ambiguity-driven formulation of interactive teaching based on the Dempster-Shafer theory. We implemented an experimental system for blocks world tasks as a proof-of-concept and show our preliminary results.

IP2-13: Impression on Human-Robot Communication Affected by Inconsistency in Expected Robot Perception

Kaito Tsukada, Mihoko Niitsuma

To develop long-term human robot communication (HRC), robots behavior must be properly perceived and interpreted by users. However, evaluations of processes involving a robot and a human are not conducted in natural situations in which humans can freely interact and observe a robot's behavior. In

this study, an experiment involving both a mental model and an impression of a robot was proposed to evaluate the effect of human expectations on HRC.

IP2-14: Haptic Workspace Control of the Humanoid Robot Arms

Longjiang Zhou, Albertus Hendrawan Adiwahono, Yuanwei Chua, Wei Liang Chan

This paper presents a haptic workspace control approach to the arms of a humanoid robot by using the Omega 7 haptic device as the control input device. The haptic device with small workspace is used to control the robot with 2 arm end-effectors of large workspace. This paper also puts forward an approach for users to feel the haptic feedback force when the robot end-effectors touch the virtual boundary areas for the safety consideration. The haptic device can move further but the robot arm end-effector will stop and the haptic force generated is proportional to the travel distance of the haptic device end-effectors until reaching the maximum value of force permitted by the designer. Simulation experiments are designed and implemented to test the motion performance of the arm end-effectors under control of haptic device and the generated haptic force when the virtual boundary walls are reached by the arm end-effectors.

IP2-15: Attention Estimation for Child-Robot Interaction

Muhammad Attamimi, Masahiro Miyata, Tetsuji Yamada, Takashi Omori, Ryoma Hida

In this paper, we present a method of estimating a child's attention, one of the more important human mental states, in a free-play scenario of child-robot interaction. First, we developed a system that could sense a child's verbal and non- verbal multimodal signals such as gaze, facial expression, proximity, and so on. Then, the observed information was used to train a Support Vector Machine (SVM) to estimate a human's attention level. We investigated the accuracy of the proposed method by comparing with a human judge's estimation, and obtained some promising results which we discuss here.

IP2-16: Designing MUSE - A Multimodal User Experience for a Shopping Mall Kiosk

Andreea I. Niculescu, Kheng Hui Yeo, Rafael E. Banchs

Multimodal interactions provide more engaging experiences allowing users to perform complex tasks while searching for information. In this paper, we present a multimodal interactive kiosk for displaying information in shopping malls. The kiosk uses visual information and natural language to communicate with visitors. Users can connect to the kiosk using their own mobile phone as speech or type input device. The connection is established by scanning a QR code displayed on the kiosk screen. Field work, observations, design, system architecture and implementation are reported.

IP3-01: Response Tendencies of Four-Year-Old Children to Communicative and Non-Communicative Robots

Mako Okanda, Yue Zhou, Takayuki Kanda, Hiroshi Ishiguro, Shoji Itakura

This study examined response tendencies in 4-year-old Japanese children (N = 45) to yes-no questions asked by a communicative, or a non-communicative robot. The children watched a video of a robot that was either responsive (communicative condition), or unresponsive (non-communicative condition) to human actions. Then, all the children watched a video of the same robot asking yes-no questions pertaining to familiar and unfamiliar objects. The children in both conditions exhibited a nay-saying bias to questions about unfamiliar objects, with children in the non-communicative condition tending to show a stronger nay-saying bias than children in the communicative condition. Children's response tendencies towards questions asked by humans and other agents are discussed.

IP3-02: Thermal Sweet Taste Machine for Multisensory Internet

Nur Amira Samshir, Nurafiqah Johari, Kasun Karunanayaka, Adrian David Cheok

This paper presents a new taste interface for multisensory communication called Thermal Sweet Taste Machine. We developed this interface in order to create sweet sensations, by manipulating the temperature on the tongue, without using chemicals. This device device changes the temperature on the surface of the tongue (from 20 ℃ to 40 ℃) within a short period of time using a computer controlled circuit. Our preliminary user studies suggested that this device would be effective in two ways; producing the sweet sensations without the aid of chemicals, and enhancing the sweetness of the food and drinks.

Here we discuss our concept, development of the interface, and some preliminary studies that has been carried out. We believe our technology would enhance the experiences and capabilities in future multisensory communication in different disciplines such as Human-Computer Interaction, human robot interactions, gaming and interacting with artificial agents.

P3-03: See Where I am Looking at: Perceiving Gaze Cues With a NAO Robot

Eunice Mwangi, Emilia Barakova, Ruixin Zhang, Marta Diaz, Andreu Catala, Matthias Rauterberg

Gaze is an important nonverbal cue in human - human communication, for example, in communicating direction of attention. Therefore, presumably being able to understand and provide gaze cues is an important aspect in robot's interactive behavior. While there is considerable progress, as regards the design of social gaze cues for robots, there is little that has been done to examine the ability of humans to read and accept help signals from a robot's gaze. In this study, we examine how people perceive gaze cues and head angles directed towards different target positions on a table when human and NAO robot are sitting against each other as in board game scenarios. From the results, we show that when the head pitch angle is higher (24°2) and the depth is less, approximately 20 cm from the robot, participants detected the positions with good accuracy. Unexpectedly, the locations on the left of the robot were detected with lower accuracy. In conclusion, we discuss the implications of this research for design of interaction settings between human and a robot that is intended for social and educational support.

IP3-04: Promoting Physical Activities by Massive Competition in Virtual Marathon

Yuya Nakanishi, Yasuhiko Kitamura

Overweight and obesity due to lack of physical activities incur a serious social problem and a number of systems to promote physical activities using information and communication technologies have been developed. Virtual Kobe Marathon is an Android app to make a user experience a marathon race virtually. It shows the Kobe Marathon course on its display and moves an agent along the course according to the user's moving distance. It also has a competition scheme to make a user compete virtually with others running at different places and times. This scheme facilitates competitions with a small number of opponents, and we, in this paper, introduce a massive competition scheme utilizing the record of 17,769 runners who participated in the 3rd Kobe Marathon. The evaluation experiment shows the massive competition scheme promotes physical activities more than the one-to-one competition scheme.

IP3-05: Development of an Embodied Avatar System using Avatar-Shadow's Color Expressions with an Interaction-Activated Communication Model

Yutaka Ishii, Tomio Watanabe, Yoshihiro Sejima

In reality, shadows are usually natural and unintentional. In virtual reality, however, they play an important role in three-dimensional effects and the perceived reality of the virtual space. An avatar's shadow can have interactive effects with the avatar itself in the virtual space. In this study, we develop an embodied avatar system using avatar-shadow color expressions with an interaction-activated communication model. This model is based on the heat conduction equation in heat-transfer engineering, and has been developed to enhance empathy during embodied interaction in avatar-mediated communication. A communication experiment is performed with 12 pairs of participants to confirm the effectiveness of the system. The results of the sensory evaluation show that interaction activation is visualized by changing avatar-shadow color.

IP3-06: Model-based Reminiscence: Guiding Mental Time Travel by Cognitive Modeling

Junya Morita, Takatsugu Hirayama, Kenji Mase, Kazunori Yamada

This paper proposes an approach to elderly mental care called model-based reminiscence, which utilizes cognitive modeling to guide a user's mental time travel. In this approach, a personalized cognitive model is constructed by implementing a user's lifelog (a photo library) in the ACT-R cognitive architecture. The constructed model retrieves photos based on human memory characteristics such as learning, forgetting, inhibition, and noise. These memory characteristics are regulated with parameter values corresponding to cognitive and emotional health. The authors assumed that a user's mental health could be assessed from their reactions to photo sequences retrieved by models with various parameter settings. The authors also assumed that it would be possible to motivate a user by guiding their memory recall with photo sequences generated from a healthy optimal state model. A simulation study indicates the

potential of this approach presenting a variety of model behaviors corresponding cognitive emotional states.

IP3-07: Exploring Gaze in Interacting with Everyday Objects with an Interactive Cup

Siti Aisyah binti Anas, Shi Qiu, Matthias Rauterberg, Jun Hu

Our eye gaze is important during social interactions. It can generate significant social cues in nonverbal communication. The feeling of being look back when we are gazing at someone influences our social behaviour. In this paper, we propose an interactive coffee cup that is responsive whenever a person is fixating on it. Taking the user's gazing behaviour as our system input modality, we want to create an environment where a person may establish social interaction with an everyday object whenever he/she is looking at it. To make an object visible to the user's eyes and for the user to feel connected with the object, it is expected that the object to possess distinctive characteristics that can acknowledge the user that it is aware of being look at. By combining the recent technology of eye trackers, mechanical design and embedded electronics, we want to explore the possibility of nonverbal social interaction between a person and inanimate object that will respond when a person is looking at it to allow social interaction and to create a sense of emotional bond between the two.

IP3-08: ChiCaRo: Tele-Presence Robot for Interacting with Babies and Toddlers

Masahiro Shiomi, Kasumi Abe, Yachao Pei, Tingyi Zhang, Narumitsu Ikeda, Takayuki Nagai

This paper reports a tele-presence robot named ChiCaRo, which is designed for interaction with babies and toddlers. ChiCaRo can physically interact with babies and toddlers by moving around and using its small hand. We conducted a field trial at a playroom where babies and toddlers can freely play to investigate ChiCaRo's effectiveness. In the experiment adult participants interacted with their babies and toddlers by ChiCaRo and another robot. The adult participants evaluated ChiCaRo highly in the context of remote interaction with their babies and toddlers.

IP3-09: Mutual Adaptation between a Human and a Robot Based on Timing Control of Sleep-time

Masahiro Kitagawa, Benjamin Luke Evans, Nagisa Munekata, Tetsuo Ono

In our research, we made a system in which a robot acquires motions from a human's motions and repeats the motion when the human communicates with the robot. By controlling the timing of the robot's imitation, we verified an effect of Mutual Adaptation between human and robot. As a result of the experiment in which we controlled the imitation timing, some experiment participants were influenced and changed their motion. We found in some cases the robot could affect human's motion by imitating that human's motion.

IP3-10: Simulation of a Tele-Operated Task under Human-Robot Shared Control

Longjiang Zhou, Keng Peng Tee, Zhiyong Huang

This poster presents simulation of a tele-operated shared controlled robot task that is integrated with a generic simulator of RADOE (Robot Application Development and Operating Environment). A customized and extendable Rviz interface plugin is designed and applied to import models, do simulation, enable real robot operation, and communicate with other projects by clicking related buttons. In the simulation process, the robot model in the simulator is controlled and visualized by human operator using an Omega 7 haptic device and automatic method, i.e., the shared control. After the simulation is conducted and satisfied, the system will send back a signal to the real robot system to execute the operation task; otherwise, simulation of the shared control process will be continued until satisfaction. We provide a simulation of a drawing task on the surface of a sphere.

IP3-11: Evaluation of a Substitution Device for Emotional Labor by using Task-Processing Time and Cognitive Load

Takeomi Goto, Hirotaka Osawa

Nowadays, physical and intellectual labor can be substituted by robotics and information technology. However, emotional labor, which causes mental stress to the workers, has not been substituted yet. Therefore, we propose a method called emotional cyborg that substitutes human-emotional representation with the use of attachable devices. In this study, we used AgencyGlass, a device that

substitutes the function of human eyes. We conducted a preliminary study to measure the task-processing time and the subject's cognitive load during the use of AgencyGlass. The result suggests that the AgencyGlass can perform joint attention similar to humans; however, its attentional shift is weaker than in humans.

IP3-12: A Web-based Platform for Collection of Human-Chatbot Interactions

Lue Lin, Luis Fernando D'Haro, Rafael Banchs

Over recent years, the world has seen multiple uses for conversational agents. Chatbots has been implemented into ecommerce systems, such as Amazon Echo's Alexa [1]. Businesses and organizations like Facebook are also implementing bots into their applications. While a number of amazing chatbot platform exists, there are still difficulties in creating data-driven-systems as they large amount of data is needed for development and training. This paper we describe an advanced platform for evaluating and annotating human-chatbot interactions, its main features and goals, as well as the future plans we have for it.

IP3-13: The Optimum Rate of Mimicry in Human-Agent Interaction

Yumiko Shinohara, Katsuhiro Kubo, Momoyo Nozawa, Misa Yoshizaki, Tomomi Takahashi, Hirofumi Hayakawa, Atsushi Hirota, Yukiko Nishizaki, Natsuki Oka

The importance of building rapport between a human and an agent is increasing with the burgeoning development of robot technology. Several recent studies have focused on the chameleon effect, using psychological concepts to investigate human-agent interaction. However, the validity of the chameleon effect in human-agent interaction is controversial. Few studies have explored the influence of individual cognitive ability and the rate of mimicry on the human-agent interaction. We explored the optimal rate of mimicry and the relationship between mimicry rate and individual empathic ability. We controlled the amount of agent mimicry and examined the effect on participants classified as high- and low-perspective takers. We found that, overall, participants preferred agents that mimicked their behavior 83% of the time. Moreover, high-, but not low-, perspective takers tended to be influenced by the mimicry rate.

IP3-14: Smart Mobile Virtual Characters: Video Characters vs. Animated Characters

Sin-Hwa Kang, Andrew W. Feng, Mike Seymour, Ari Shapiro

This study investigates presentation techniques for a chatbased virtual human that communicates engagingly with users via a smartphone outside of the lab in natural settings. Our work compares the responses of users who interact with an animated 3D virtual character as opposed to a real human video character capable of displaying backchannel behaviors. The findings of our study demonstrate that people are socially attracted to a 3D animated character that does not display backchannel behaviors more than a real human video character that presents realistic backchannel behaviors. People engage in conversation more by talking for a longer amount of time when they interact with a 3D animated virtual human that exhibits backchannel behaviors, compared to communicating with a real human video character that does not display backchannel behaviors.

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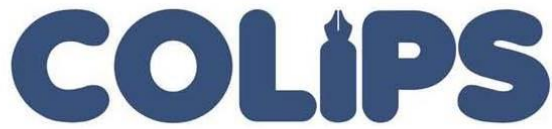
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