External Awards

Outstanding Paper Award

Winner: Ryo Ishii, Kazuhiro Otsuka, Shiro Kumano, and Junji Yamato, NTT Communication Science Research Laboratories
Date: November 14, 2014
Organization: 16th ACM International Conference on Multimodal Interaction

For "Analysis of Respiration for Prediction of "Who Will Be Next Speaker and When" in Multi-Party Meetings."

To build a model for predicting the next speaker and the start time of the next utterance in multi-party meetings, we performed a fundamental study of how respiration could be effective for the prediction model. The results of the analysis reveal that a speaker inhales more rapidly and quickly right after the end of a unit of utterance in turn-keeping. The next speaker takes a bigger breath toward speaking in turn-changing than listeners who will not become the next speaker. The results of the evaluation of our prediction model suggest that the speaker's inhalation right after a unit of utterance is effective for predicting whether turn-keeping or turn-changing will occur about 350 ms before the start time of the next utterance, and that the listener's inhalation before the next utterance is effective for predicting the next speaker in turn-changing about 900 ms before the start time of the next utterance.
Published as: R. Ishii, K. Otsuka, S. Kumano, and J. Yamato, "Analysis of Respiration for Prediction of "Who Will Be Next Speaker and When" in Multi-Party Meetings," Proc. of the 16th ACM International Conference on Multimodal Interaction, pp. 18–25, Istanbul, Turkey, November 2014.

APMC 2014 Prize

Winner: Kazuki Maruta, NTT Access Network Service Systems Laboratories; Jun Mashino, Takatoshi Sugiyama, NTT Network Innovation Laboratories
Date: November 6, 2014
Organization: Institute of Electronics, Information and Communication Engineers (IEICE)

For "Blind Adaptive Arrays with Subcarrier Transmission Power Assignment for Spectrum Superposing."
Published as: K. Maruta, J. Mashino, and T. Sugiyama, "Blind Adaptive Arrays with Subcarrier Transmission Power Assignment for Spectrum Superposing," Proc. of the 2014 Asia-Pacific Microwave Conference (APMC 2014), Sendai, Japan, November 2014.

Hornarable Mention Poster Award

Winner: Takahiro Matsumoto, Shunichi Seko, Ryosuke Aoki, Akihiro Miyata, Tomoki Watanabe, and Tomohiro Yamada, NTT Service Evolution Laboratories
Date: October 30, 2014
Organization: The Second International Conference on Human-Agent Interaction (HAI 2014) organizing committee

For "Affective Agents for Enhancing Emotional Experience."
We propose shared emotional experience agents that enhance the user's emotional experience through emotional contagion. Our experiment had 12 participants, who watched videos together with a robot that expressed an emotional state using its body and voice. The results suggest that the affective robot makes the user more excited and relaxed, and less depressed and afraid than if they viewed it alone.
Published as: T. Matsumoto, S. Seko, R. Aoki, A. Miyata, T. Watanabe, and T. Yamada, "Affective Agents for Enhancing Emotional Experience," Proc. of HAI 2014, pp. 169–172, Ibaraki, Japan, October 2014.

Best Technical Exhibition Award

Winner: Takayuki Yamada, Doohwan Lee, Hiroyuki Shiba, Yo Yamaguchi, Takana Kaho, Tadao Nakagawa, and Kazuhiro Uehara, NTT Network Innovation Laboratories
Date: October 31, 2014
Organization: SmartCom2014 (Singapore - Japan International Workshop on Smart Wireless Communications) organizing committee

For "Broadband Spectrum Sensing Platform based on Received Waveform Cross-correlation Using Distributed Sensors."

ETSI NFV Excellence Award

Winner: Tetsuya Nakamura, Research Laboratories, NTT DOCOMO
Date: November 21, 2014
Organization: European Telecommunications Standards Institute (ETSI)

For outstanding leadership and support for network functions virtualization (NFV) in Phase 1.

Papers Published in Technical Journals and Conference Proceedings

Evaluation of Window Interface in Remote Cooperative Work Involving Pointing Gestures

R. Ishii, S. Ozawa, H. Kawamura, A. Kojima, Y. Nakano, and K. Otsuka

Proc. of the Seventh International Conference on Advances in Computer-Human Interactions (ACHI 2014), pp. 242–251, Barcelona, Spain, March 2014.

We previously proposed a "MoPaCo" window interface system that can reproduce a communication partner's space within a display as if the display were a glass window to achieve geometrical consistency between remote spaces. Experiment results demonstrated it enables users to feel that the distance between themselves and their conversational partners on video is about the same as in a face-to-face situation and the partner is actually present. We consider MoPaCo can generate video images that smoothly transmit gazes and pointing gestures; this paper describes experimental tests of the system's effectiveness in doing so. Results suggest MoPaCo allows users to accurately identify target objects as they would under face-to-face conditions through an actual glass window. Results of experiments on conversation quality show MoPaCo facilitates smooth conversation and communication among users and strengthens their memories of the conversations, suggesting the users actively engage in conversation, and the system makes a strong impression on them.

Nine Years of Memory of Personal Things: Accuracy and Distortions

N. Shingaki, M. Kitabata, H. Matsuoka, T. Takada, A. Orino, Y. Kato, Y. Tsuzuki, and T. Owada

Cognitive Studies, Vol. 21, No. 1, pp. 15–28, March 2014.

How should we save our memories? Many people keep diaries and take pictures for that purpose. In this study, we kept things of personal significance in a time capsule for nine years and examined whether personal memories could be saved in a time capsule and how they might possibly change over time. We held a workshop in 2003 when participants put something that they had possessed which had personal significance at that time of their life. They were interviewed to explain what kinds of significance these possessions had for them, and these interview sessions were recorded. Nine years after the initial workshop, the participants came together again. Before the time capsule was opened, they were asked to recall what they had put in the time capsule and to describe in what ways their item in the time capsule had been significant to them. By comparing the contents of the participants' responses between 2003 and 2012, we found that a great deal of the contents had changed.

Analysis and Modeling of Next Speaking Start Timing in Multi-party Meetings

R. Ishii, K. Otsuka, S. Kumano, and J. Yamato

Proc. of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2014), pp. 694–698, Florence, Italy, May 2014.

To realize a conversational interface where an agent system can smoothly communicate with multiple persons, it is imperative to know how the start timing of speaking is decided. We demonstrate a relationship between gaze transition patterns and the start timing of the next spoken utterance against the end of the last spoken utterance in multi-party meetings. Then, we construct a prediction model for the start timing using gaze transition patterns near the end of an utterance. An analysis of data collected from natural multi-party meetings reveals a strong relationship between gaze transition patterns of the current speaker, next speaker, and listener and the start timing of the next speaker. On the basis of the results, we used gaze transition patterns of the speaker, next speaker, and listener, and mutual gaze as variables, and devised several prediction models. A model using all features performed the best and was able to predict the start timing well.

Quantum Algorithms for Finding Constant-sized Sub-hypergraphs over 3-uniform Hypergraphs

F. Le Gall, H. Nishimura, and S. Tani

Proc. of the 20th International Computing and Combinatorics Conference (COCOON 2014), pp. 429–440, Atlanta, GA, USA, August 2014.

We develop a general framework to construct quantum algorithms that detect whether a 3-uniform hypergraph given as input contains a sub-hypergraph isomorphic to a pre-specified constant-sized hypergraph. This framework is based on the concept of nested quantum walks recently proposed by Jeffery, Kothari, and Magniez [SODA'13], and extends the methodology designed by Lee, Magniez, and Santha [SODA'13] for similar problems over graphs. As applications, we obtain a quantum algorithm for finding a 4-clique in a 3-uniform hypergraph on n vertices with query complexity $O(n^{1.883})$, and a quantum algorithm for determining if a ternary operator over a set of size n is associative with query complexity $O(n^{2.113})$.

An In-Operation IP-over-Optical Network Planning Method that Supports Unpredictable IP Traffic Transitions

T. Tanaka and A. Hirano

Proc. of the 40th European Conference on Optical Communications (ECOC 2014), Cannes, France, September 2014.

We propose a first-time in-operation IP (Internet protocol)-over-optical network planning method that offers optical path provisioning criteria under temporal and geographical IP traffic changes. Simulations show the proposed method can support traffic transitions with less additional optical path provisioning.

Proposal and Evaluation of Web Framework for Ubiquitous Sensor Network

T. Nakamura, K. Mori, Y. Higashijima, M. Nakamura, H. Matsumura, and M. Matsuo

IEICE Transactions on Communications (Japanese Edition), Vol. J97-B, No. 9, pp. 793–807, September 2014.

This paper proposes a web framework for a ubiquitous sensor network (u-framework), which supports development of server-side applications used for M2M services on wireless sensor networks, and

evaluates the proposed method by applying it to development of actual systems. We first analyzed some examples of vertical-domain services using wireless sensor networks, and found that server-side functions in each of the services share some degree of similarity. The proposed u-framework is built on a web framework and extends it on supporting sensor networks. Our method can save a great deal of effort in the development of such common functions. This paper also proposes the real-world development studio, which supports development and debugging of sensor network services including server-side applications and sensor terminals. Evaluations of the proposed methods applied to practical system developments for two independent field trials are also explained in this paper.

Distinct Pseudo-attraction Force Sensation by a Thumb-sized Vibrator that Oscillates Asymmetrically

T. Amemiya and H. Gomi

Proc. of Eurohaptics 2014, pp. 88–95, Versailles, France, June 2014.

This paper describes the development of a thumb-sized force display for experiencing a kinesthetic illusory sensation of being continuously pushed or pulled. We previously succeeded in creating a sensation of being pulled with a prototype based on a crank-slider mechanism, but recently we did so with a thumb-sized actuator that oscillates asymmetrically.

With this tiny and light force display, the directed force sensation is perceived just as strongly as with the previous larger prototypes. We conducted a user study using the method of paired comparisons. The results show that a specific vibrator with a 7-ms pulse at 40 Hz induces the sensation most clearly and effectively.

Influence of Dolly Shape on Adhesive Property and Correlation Between Adhesion and Cross-cut Test Results

T. Miwa, Y. Takeshita, S. Sakata, and T. Sawada

Rust Prevention and Control Japan, Vol. 58, No. 10, pp. 368–372, October 2014.

Coated steel structures need to be checked regularly for deterioration in the coatings and subsequently repainted at an appropriate time. An adhesion test is the standard method for evaluating coating adhesion, and a cross-cut test is usually used to evaluate peel resistance. In this study, adhesion was measured on the same sample using two kinds of dollies with different shapes. One dolly had a hand-hold with a spherical shape. In the adhesion test with this dolly, it was found that the relative standard deviation in multiple adhesion measurements on the same sample was reduced to one fourth of that using a standard dolly. Additionally, a new method of classifying cross-cut test results for a coating on hot dip galvanized steel was developed, and it was confirmed that there was consistency between the classification and the adhesion of the coatings.

Violation of Equipartition of Energy in Thermal Noise of a Small DRAM

K. Nishiguchi and A. Fujiwara

Proc. of the 27th International Microprocesses and Nanotechnology Conference (MNC 2014), 6B-4-3, Fukuoka, Japan, November 2014.

We introduce a transition between the valid and invalid law of equipartition of energy in thermal noise in a small DRAM (dynamic random access memory). We analyzed Brownian motion, i.e., thermal noise, of single electrons entering and exiting a small capacitor whose E_c is comparable to kBT. When $E_c > kBT$, the electron motion is suppressed due to the violation of the law of equipartition of energy.

Zero Dimensional Ion-sensitive Field-effect Transistors

R. Sivakumarasamy, K. Nishiguchi, A. Fujiwara, D. Vuillaume, and N. Clément

Proc. of MNC 2014, 6P-7-61, Fukuoka, Japan, November 2014.

We propose to fabricate and characterize a tiny pH electrode so small that the number of charged sites can be statistically null. We also show a rupture in the universal pH response of such sensors and propose a dedicated model.

Tunnel Diode Composed of MoS$_2$/SiO$_2$/Si Heterojunction

K. Nishiguchi, A. Castellanos-Gomez, H. Yamaguchi, A. Fujiwara, H. S. J. van der Zant, and G. A. Steele

Proc. of MNC 2014, 5D-3-2, Fukuoka, Japan, November 2014.

We introduce a tunnel diode based on a combination of MoS$_2$ with a Si MOSFET. An n-type-MoS$_2$/SiO$_2$/p-type-Si heterostructure provides current characteristics with negative differential resistance (NDR) reflecting the number of the MoS$_2$ layers.

Analysis of Timing Structure of Eye Contact in Turn-changing

R. Ishii, K. Otsuka, S. Kumano, and J. Yamato

Proc. of the 16th ACM International Conference on Multimodal Interaction (ICMI 2014), the 7th Workshop on Eye Gaze in Intelligent Human Machine Interaction, pp. 15–20, Istanbul, Turkey, November 2014.

With the aim of constructing a model for predicting the next speaker and the start of the next utterance in multi-party meetings, we focus on the timing structure of the eye contact between the speaker, the listener, and the next speaker. The results of analysis show that the listeners in turn-keeping tend to look at the speaker first more often, before the speaker looks at the listeners than the next speaker in turn-changing looks at the speaker first before the speaker looks at the next speaker when the eye contact with the speaker happens. The listeners in turn-keeping also tend to look away from the speaker later more often, after the speaker looks away from the listener than the listeners and the next speaker in turn-changing look away from the speaker later when the eye contact with the speaker happens.

OpenStack Upgrade Without Down Time

T. Natsume and Y. Liu

Proc. of OpenStack Summit November 2014 Paris, Paris, France, November 2014.

Many public cloud service providers utilize OpenStack software to build IaaS (Infrastructure as a Service) systems. OpenStack is open source software that is developed by a community that many organizations and individuals participate in. New versions of OpenStack are released at intervals of six months, and only the two latest versions are maintained. Therefore, system update methods without service interruption are necessary for public cloud service providers who want to keep the systems up to date. This document proposes system update methods without service interruption in public cloud services

and explains an evaluation of the proposed update methods. Furthermore, we describe some problematic issues which were found in the evaluation. On the basis of these issues, items to be improved are suggested to the OpenStack community.

Impact of Pulse Poling on Static and Dynamic Ferroelastic-domain Contributions in Tetragonal Pb(Ti, Zr)O$_3$ Films Determined by In-situ x–ray Diffraction Analysis

M. Nakajima, A. Wada, T. Yamada, Y. Ehara, T. Kobayashi, and H. Funakubo

Journal of Applied Physics, Vol. 116, No. 19, pp. 194102–194102-7, November 2014.

The effects of bipolar pulse poling on the ferroelastic domain structure and their contribution to the electrical and piezoelectric properties of Pb(Ti$_{0.7}$Zr$_{0.3}$)O$_3$ films are investigated. Micro x-ray diffraction measurements clearly show that the volume fraction of the c-domain increases irreversibly as the poling field is increased, leading to changes in the remanent polarization, dielectric constant, and piezoelectric coefficient. Theoretical estimations well explain the changes of remanent polarization and dielectric constant, but the increase in piezoelectric coefficient is much larger than the theoretical estimation. *In-situ* x-ray diffraction analysis under an electric field reveals that this disagreement is due to the unexpected activation of the ferroelastic domain wall motion. Our results provide new insight into the poling effect on the electric and piezoelectric properties of ferroelectric films.

Electric Tuning of Direct-indirect Optical Transitions in Silicon

J. Noborisaka, K. Nishiguchi, and A. Fujiwara

Scientific Reports, Vol. 4, No. 6950, pp. 1–6, November 2014.

Electronic band structures in semiconductors are uniquely determined by the constituent elements of the lattice. For example, bulk silicon has an indirect bandgap, and it prohibits efficient light emission. Here, we report the electrical tuning of the direct/indirect band optical transition in an ultrathin silicon-on-insulator (SOI) gated metal-oxide-semiconductor (MOS) light-emitting diode. A special Si/SiO$_2$ interface formed by high-temperature annealing that shows stronger valley coupling enables us to observe phononless direct optical transition. Furthermore, by controlling the gate field, its strength can be electrically tuned to 16 times that of the indirect transition, which is nearly 800 times larger than the weak direct transition in bulk silicon. These results will therefore assist the development of both complementary MOS (CMOS)-compatible silicon photonics and the emerging "valleytronics" based on the control of the valley degree of freedom.

Auto Bias Control and Bias Hold Circuit for IQ-modulator in Flexible Optical QAM Transmitter with Nyquist Filtering

H. Kawakami, T. Kobayashi, M. Yoshida, T. Kataoka, and Y. Miyamoto

Optical Express, Vol. 22, No. 23, pp. 28163–28168, November 2014.

An auto bias control (ABC) technique for the IQ (in-phase and quadrature)-modulator of a flexible optical QAM (quadrature amplitude modulation) transmitter is described. This technique can support various optical QAM signal formats with Nyquist filtering and electronic dispersion pre-compensation. 16-, 32-, and 64-QAM signals (21 Gbaud) are successfully generated, and all bias voltages are held to their optimum value even when signal format is changed.

Improving Method of Disaster Response Manual Based on the Guidelines of the Cabinet Office by ICT

F. Ichinose, H. Hayashi, Y. Takeguchi, T. Yamamoto, M. Zusho, and Y. Maeda

Journal of Institute of Social Safety Science, No. 24, pp. 201–210, November 2014.

The guidelines for earthquakes occurring in a local city were exhibited in August 2013 by the Cabinet Office. These guidelines are a checklist of response actions to implement in the event of an earthquake. It is expected that a municipality can prepare a very effective emergency response manual if the municipality bases the manual on these guidelines and clarifies the Emergency Support Functions in the manual. In this paper, we describe the efficient method used in Kashihara-shi. We have improved the Disaster Response Manual and clarified the Emergency Support Functions in Kashihara-shi based on the guidelines and by utilizing information and communications technology.