External Awards

Best Work-in-Progress Paper Award
Winner: Scinob Kuroki, Nobuhiro Hagura, Shin'ya Nishida, Patrick Haggard, and Junji Watanabe, NTT Communication Science Laboratories
Date: June 25, 2015
Organization: The Institute of Electrical and Electronics Engineers (IEEE) Technical Committee on Haptics

For "Asian Spice Sets Fingers Trembling."
Published as: S. Kuroki, N. Hagura, S. Nishida, P. Haggard, and J. Watanabe, "Asian Spice Sets Fingers Trembling," The 2015 IEEE World Haptics Conference, Poster: WIP-16, Chicago, USA, June 2015.

Kasami Award
Winner: Yuichi Sudo, NTT Secure Platform Laboratories
Date: October 6, 2015
Organization: Osaka University

For "A Study on Approaches for Stable Distributed Systems in Unstable Network Environments."
Published as: Y. Sudo, "A Study on Approaches for Stable Distributed Systems in Unstable Network Environments," Ph.D. thesis, Osaka University.

Innovative Technologies 2015
Winner: Takahiro Kawabe, Taiki Fukiage, Masataka Sawayama, and Shin'ya Nishida, NTT Communication Science Laboratories
Date: October 22, 2015
Organization: The Ministry of Economy, Trade and Industry (METI) of Japan

For the development of *HenGenTo*.
METI has selected 20 outstanding content technologies for Innovative Technologies 2015, which is part of the Program to Promote Innovation in Digital Content Technologies, aiming to promote their further utilization and development.
HenGenTo is a light projection technology that works by elucidating the principle of humans' liquid perception. Just by projecting a special light, you can make a still picture appear animated.

SCIS 2015 Innovation Paper Award
Winner: Mehdi Tibouchi, NTT Secure Platform Laboratories; Pierre-Alain Fouque, University of Rennes; and Tancrede Lepoint, CryptoExperts
Date: January 20, 2016
Organization: The Institute of Electronics, Information and Communication Engineers (IEICE) Engineering Sciences Society, Technical Committee on Information Security

For "Security Analysis of the Co-ACD Assumption and of Homomorphic Encryption Schemes Based on It."
Published as: M. Tibouchi, P. A. Fouque, and T. Lepoint, "Security Analysis of the Co-ACD Assumption and of Homomorphic Encryption Schemes Based on It," Proc. of SCIS2015 (the 32nd Symposium on Cryptography and Information Security), 3E4-4, Kokura, Fukuoka, Japan, Jan. 2015.

Kenjiro Takayanagi Achievement Award
Winner: Kunio Kashino, NTT Communication Science Laboratories
Date: January 20, 2016
Organization: The Takayanagi Kenjiro Foundation

For the research and development of audio, video, and other media analysis and search technologies.

Young Researcher's Award
Winner: Yasuhiro Teramoto, NTT Secure Platform Laboratories
Date: March 17, 2016
Organization: IEICE

For "Intrusion Path Prediction of Advanced Persistent Threat."
Published as: Y. Teramoto, B. Hu, T. Kishi, Y. Nagafuchi, T. Koyama, and H. Kitazume, "Intrusion Path Prediction of Advanced Persistent Threat," Proc. of Technical Committee on Information Networks, Osaka, Japan, Oct. 2015 (in Japanese).

Young Researcher's Award
Winner: Daisuke Kitayama, NTT Device Technology Laboratories
Date: March 17, 2016
Organization: IEICE

For "Study on Dependency of Hybridizing Modes on Structure of Layered-split-ring Resonators" and "Study on Split-ring-resonator-based Metamaterial Flat Lens at 120 GHz."
Published as: D. Kitayama, H.-J. Song, M. Yaita, and A. Hirata, "Study on Dependency of Hybridizing Modes on Structure of Layered-split-ring Resonators," Proc. of the 2015 IEICE General Conference, C-2-46, Kusatsu, Shiga, Japan, Mar. 2015 (in Japanese); D. Kitayama, H.-J. Song, M. Yaita, and A. Hirata, "Study on Split-ring-resonator-based Metamaterial Flat Lens at 120 GHz," Proc. of the 2015 IEICE Society Conference, C-2-25, Sendai, Miyagi, Japan, Sept. 2015 (in Japanese).

Young Researcher's Award
Winner: Hitoshi Wakita, NTT Device Technology Laboratories
Date: March 17, 2016
Organization: IEICE

For "Study on Compact Quad-channel Driver Module without Conical Coil."
Published as: H. Wakita, M. Nagatani, S. Yamanaka, H. Tanobe, and H. Nosaka, "Study on Compact Quad-channel Driver Module without Conical Coil," Proc. of the 2015 IEICE General Conference, C-10-5, Kusatsu, Shiga, Japan, Mar. 2015 (in Japanese).

IEEE James L. Flanagan Speech and Audio Processing Award
Winner: Takehiro Moriya, NTT Communication Science Laboratories
Date: March 21, 2016
Organization: IEEE

For contributions to speech and audio coding algorithms and standardization.

JSAP Silicon Technology Division Incentive Award
Winner: Jinichiro Noborisaka, NTT Basic Research Laboratories
Date: March 21, 2016
Organization: The Japan Society of Applied Physics (JSAP)

For "Electric Tuning of Direct-indirect Optical Transitions in Silicon."
Published as: J. Noborisaka, K. Nishiguchi, and A. Fujiwara, "Electric Tuning of Direct-indirect Optical Transitions in Silicon," Scientific Reports 4, Article no. 6950, 2014.

The Tingye Li Innovation Prize

Winner: Kohki Shibahara, NTT Network Innovation Laboratories
Date: March 22, 2016
Organization: Optical Society of America

For "Dense SDM (12-core × 3-mode) Transmission over 527 km with 33.2-ns Mode-dispersion Employing Low-complexity Parallel MIMO Frequency-domain Equalization."
Published as: K. Shibahara, T. Mizuno, H. Takara, A. Sano, H. Kawakami, D. Lee, Y. Miyamoto, H. Ono, M. Oguma, Y. Abe, T. Kobayashi, T. Matsui, R. Fukumoto, Y. Amma, T. Hosokawa, S. Matsuo, K. Saito, H. Nasu, and T. Morioka, "Dense SDM (12-core × 3-mode) Transmission over 527 km with 33.2-ns Mode-dispersion Employing Low-complexity Parallel MIMO Frequency-domain Equalization," Proc. of the 2015 Optical Fiber Communications Conference and Exhibition, Los Angeles, CA, USA, Mar. 2015.

2015 Technology of the Year Award

Winner: The METIS (Mobile and wireless communications Enablers for the Twenty-twenty Information Society) project
Date: March 22, 2016
Organization: Wireless Innovation Forum

For the development of 5G radio channel models.
The METIS is a European project whose objective is to lay the foundations for 5G, the fifth-generation mobile and wireless communications system, for 2020 and beyond. The METIS project's development of 5G radio channel models received the award due to its contribution to the future development of the next-generation mobile communications (5G) by developing a complete new set of radio channel models based on realistic end-user scenarios and requirements. These new models were studied by the METIS channel measurement and modelling group, which includes Anite (Chair), Ericsson, NTT DOCOMO, DOCOMO Euro-labs, Fraunhofer HHI, Nokia, Aalto University, University of Oulu, and Elektrobit.
Published as: V. Nurmela, A. Karttunen, A. Roivainen, L. Raschkowski, T. Imai, J. Järveläinen, J. Medbo, J. Vihriälä, J. Meinilä, K. Haneda, V. Hovinen, J. Ylitalo, N. Omaki, K. Kusume, P. Kyösti, T. Jämsä, A. Hekkala, R. Weiler, and M. Peter, "METIS Channel Models," METIS Deliverable D1.4, July 2015.

Excellent Woman Researcher Award of the Electrochemical Society of Japan

Winner: Nahoko Kasai, NTT Basic Research Laboratories
Date: March 30, 2016
Organization: The Electrochemical Society of Japan

For her research on nanobio-interfaces for detecting and controlling biological information.

Papers Published in Technical Journals and Conference Proceedings

Distributed Forests for MapReduce-based Machine Learning

R. Wakayama, R. Murata, A. Kimura, T. Yamashita, Y. Yamauchi, and H. Fujiyoshi

Proc. of ACPR 2015 (the 3rd IAPR Asian Conference on Pattern Recognition), Kuala Lumpur, Malaysia, November 2015.

This paper proposes a novel method for training random forests with big data on MapReduce clusters. Naive implementation of random forests on distributed systems easily overfits the training data, yielding poor classification performance. This is because each cluster node can have access to only a small fraction of the training data. The proposed method tackles this problem by introducing the following three steps. (1) Shared forests are built in advance on the master node and shared with all the cluster nodes. (2) With the help of transfer learning, the shared forests are adapted to the training data placed on each cluster node. (3) The adapted forests on every cluster node are returned to the master node, and irrelevant trees yielding poor classification performance are removed to form the final forests.

Experimental results show that our proposed method for MapReduce clusters can quickly learn random forests without any sacrifice of classification performance.

Neural Timing Signal for Precise Tactile Timing Judgments

S. Kuroki, J. Watanabe, and S. Nishida

Journal of Neurophysiology, Vol. 115, pp. 1620–1629, February 2016.

The brain can precisely encode the temporal relationship between tactile inputs. While behavioural studies have demonstrated precise interfinger temporal judgments, the underlying neural mechanism remains unknown. Computationally, two kinds of neural responses can act as the information source. One is the phase-locked response to the phase of relatively slow inputs, and the other is the response to the amplitude change of relatively fast inputs. To isolate the contributions

of these components, we measured performance of a synchrony judgment task for sine wave and amplitude-modulation (AM) wave stimuli. The sine wave stimulus was a low-frequency sinusoid, with the phase shifted in the asynchronous stimulus. The AM wave stimulus was a low-frequency sinusoidal AM of a 250-Hz carrier, with only the envelope shifted in the asynchronous stimulus. In the experiment, three stimulus pairs, two synchronous ones and one asynchronous one, were sequentially presented to neighboring fingers, and participants were asked to report which one was the asynchronous pair. We found that the asynchrony of AM waves could be detected as precisely as a single impulse pair, with the threshold asynchrony being ~20 ms. On the other hand, the asynchrony of sine waves could not be detected at all in the range from 5 to 30 Hz. Our results suggest that the timing signal for tactile judgments is provided not by the stimulus phase information but by the envelope of the response of the high-frequency-sensitive Pacini channel (PC), although they do not exclude a possible contribution of the envelope of non-PCs.

Mode and Polarization Division Multiplexed Signal Detection with Single Coherent Receiver Using Mode-selective Coherent Detection Technique

F. Hamaoka, S. Okamoto, K. Horikoshi, K. Yonenaga, A. Hirano, and Y. Miyamoto

Proc. of OFC (Optical Fiber Communication Conference and Exhibition) 2016, Th3A.6, Anaheim, CA, USA, March 2016.

We experimentally demonstrate that a single coherent receiver can successfully receive mode and polarization division multiplexed signals using the mode division multiplexed (MDM)-to-frequency division multiplexed signal conversion scheme based on our proposed mode-selective coherent detection technique to develop low-complexity MDM systems.

MineSpider: Extracting Hidden URLs behind Evasive Drive-by Download Attacks

Y. Takata, M. Akiyama, T. Yagi, T. Hariu, and S. Goto

IEICE Transactions on Information and Systems, Vol. E99-D, No. 4, pp. 860–872, April 2016.

Drive-by download attacks force users to automatically download and install malware by redirecting them to malicious URLs that exploit vulnerabilities of the user's web browser. In addition, several evasion techniques, such as code obfuscation and environment-dependent redirection, are used in combination with drive-by download attacks to prevent detection. In environment-dependent redirection, attackers profile the information on the user's environment, such as the name and version of the browser and browser plugins, and launch a drive-by download attack on only certain targets by changing the destination URL. When malicious content detection and collection techniques such as honeyclients are used that do not match the specific environment of the attack target, they cannot detect the attack because they are not redirected. Therefore, it is necessary to improve analysis coverage while countering these adversarial evasion techniques.

Millimeter-wave Close Proximity High-speed Data Transfer System

T. Nakagawa, H. Toshinaga, T. Tsubaki, T. Seki, and M. Shimizu

IEICE Communications Express, Vol. 5, No. 4, pp. 114–117, April 2016.

This paper presents the system concept, transceiver architecture, and control sequence for a millimeter-wave (60-GHz) band close proximity high-speed data transfer system. The communication range and the use cases are limited to achieve a fast link setup time and a stable point-to-point connection. Prototype equipment developed for the system includes three types of wireless transceivers; cooperative operation among them makes it possible to reduce the link setup time and limit the communication range. The system's control sequence enables the link setup time to be reduced from 7 seconds to 0.2 seconds.

A Strongly Coupled Λ-type Micromechanical System

H. Okamoto, R. Schilling, H. Schütz, V. Sudhir, D. J. Wilson, H. Yamaguchi, and T. J. Kippenberg

Applied Physics Letters, Vol. 108, p. 153105, April 2016.

We study a classical Λ-type three-level system based on three high-Q micromechanical beam resonators embedded in a gradient electric field. By modulating the strength of the field at the difference frequency between adjacent beam modes, we realize strong dynamic two-mode coupling, via the dielectric force. Driving adjacent pairs simultaneously, we observe the formation of a purely mechanical "dark" state and an all-phononic analog of coherent population trapping—signatures of strong three-mode coupling. The Λ-type micromechanical system is a natural extension of previously demonstrated "two-level" micromechanical systems and adds to the toolbox for engineering of all-phononic micromechanical circuits and arrays.
