External Awards

The 63rd JSAP Spring Meeting 2016, Poster Award
Winner: Masaaki Ono, Hideaki Taniyama, Masato Tsunekawa, Eiichi Kuramochi, Kengo Nozaki, and Masaya Notomi, NTT Basic Research Laboratories
Date: April 1, 2016
Organization: The Japan Society of Applied Physics (JSAP)

For "Demonstration of Efficient Mode Conversion to Slot Waveguides with $\lambda^2/2000$ Cross-sectional Area."
Published as: M. Ono, H. Taniyama, M. Tsunekawa, E. Kuramochi, K. Nozaki, and M. Notomi, " Demonstration of Efficient Mode Conversion to Slot Waveguides with $\lambda^2/2000$ Cross-sectional Area," The 63rd JSAP Spring Meeting, 20p-P4-8, Tokyo, Japan, Mar. 2016.

ISSJ 10th Anniversary Best Paper Award
Winner: Takeshi Morita and Yunki Hong, Keio University; Shinobu Saito, NTT Software Innovation Center; Tadashi Iijima and Takahira Yamaguchi, Keio University
Date: May 14, 2016
Organization: Information Systems Society of Japan (ISSJ)

For "A Support Tool for Production Management Process Modeling Based on SCOR Ontology."
Published as: T. Morita, Y. Hong, S. Saito, T. Iijima, and T. Yamaguchi, "A Support Tool for Production Management Process Modeling Based on SCOR Ontology," JISSJ, Vol. 11, No. 1, pp.13–47, Dec. 2015.

ITU-AJ Award, Encouragement Award: ICT Field
Winner: Kenjiro Arai, NTT Network Service Systems Laboratories
Date: May 17, 2016
Organization: The ITU Association of Japan

For his contribution to standardization in 3GPP (3rd Generation Partnership Project)/TTC (Telecommunication Technology Committee) call control signaling in IMS (Internet-protocol Multimedia Subsystem).

Best Paper Award
Winner: Doohwan Lee, Hirofumi Sasaki, Hiroyuki Fukumoto, and Tadao Nakagawa, NTT Network Innovation Laboratories
Date: May 17, 2016
Organization: 2016 International Workshop on Smart Wireless Communications (SmartCom2016) organizing committee

For "Toward Realization of a New Wireless Transmission Technology: Orbital Angular Momentum (OAM) Multiplexing."
Published as: D. Lee, H. Sasaki, H. Fukumoto, and T. Nakagawa, "Toward Realization of a New Wireless Transmission Technology: Orbital Angular Momentum (OAM) Multiplexing," IEICE Tech. Rep., Vol. 116, No. 29, SR2016-16, pp. 57–58, May 2016.

Best Paper Award
Winner: Thuan Ngo, Hiroki Nishiyama, and Nei Kato, Tohoku University; Satoshi Kotabe and Hiroshi Tohjo, NTT Network Innovation Laboratories
Date: May 18, 2016
Organization: 2016 IEEE (Institute of Electrical and Electronics Engineers) 83rd Vehicular Technology Conference (VTC2016-Spring) committee

For "A Novel Graph-based Topology Control Cooperative Algorithm for Maximizing Throughput of Disaster Recovery Networks."
Published as: T. Ngo, H. Nishiyama, N. Kato, S. Kotabe, and H. Tohjo, "A Novel Graph-based Topology Control Cooperative Algorithm for Maximizing Throughput of Disaster Recovery Networks," Proc. of IEEE VTC2016-Spring, Nanjing, China, May 2016.

Best Paper Award
Winner: Hideki Kuribayashi, Tohoku University; Katsuya Suto, University of Waterloo; Hiroki Nishiyama and Nei Kato, Tohoku University; Kimihiro Mizutani, Takeru Inoue, and Osamu Akashi, NTT Network Innovation Laboratories
Date: May 25, 2016
Organization: IEEE International Conference on Communications (ICC) Best Paper Award Selection Committee

For "A Mobility-based Mode Selection Technique for Fair Spatial Dissemination of Data in Multi-channel Device-to-device Communication."
Published as: H. Kuribayashi, K. Suto, H. Nishiyama, N. Kato, K. Mizutani, T. Inoue, and O. Akashi, "A Mobility-based Mode Selection Technique for Fair Spatial Dissemination of Data in Multi-channel Device-to-device Communication," Proc. of IEEE ICC 2016, Kuala Lumpur, Malaysia, May 2016.

Best Paper Award
Winner: Thuan Ngo, Hiroki Nishiyama, and Nei Kato, Tohoku University; Satoshi Kotabe and Hiroshi Tohjo, NTT Network Innovation Laboratories
Date: May 25, 2016
Organization: IEEE International Conference on Communications (ICC) Best Paper Award Selection Committee

For "GHAR: Graph-based Hybrid Adaptive Routing for Cognitive Radio Based Disaster Response Networks."
Published as: T. Ngo, H. Nishiyama, N. Kato, S. Kotabe, and H. Tohjo, "GHAR: Graph-based Hybrid Adaptive Routing for Cognitive Radio Based Disaster Response Networks," Proc. of IEEE ICC 2016, Kuala Lumpur, Malaysia, May 2016.

Best Industry Paper Award
Winner: Ho-Jin Song, Toshihiko Kosugi, Hiroshi Hamada, Takuro Tajima, Amin El Moutaouakil, Hideaki Matsuzaki, and Makoto Yaita, NTT Device Technology Laboratories; Yoichi Kawano, Tsuyoshi Takahashi, Yasuhiro Nakasha, and Naoki Hara, Fujitsu Limited; Katsumi Fujii, Issei Watanabe, and Akifumi Kasamatsu, National Institute of Information and Communications Technology
Date: May 27, 2016
Organization: IEEE International Microwave Symposium (IMS) 2016 committee

For "Demonstration of 20-Gbps Wireless Data Transmission at 300 GHz for KIOSK Instant Data Downloading Applications with InP MMICs."
Published as: H.-J. Song, T. Kosugi, H. Hamada, T. Tajima, A. E. Moutaouakil, H. Matsuzaki, M. Yaita, Y. Kawano, T. Takahashi, Y. Nakasha, N. Hara, K. Fujii, I. Watanabe, and A. Kasamatsu, "Demonstration of 20-Gbps Wireless Data Transmission at 300 GHz for KIOSK Instant Data Downloading Applications with InP MMICs," Proc. of IMS2016, San Francisco, CA , USA, May 2016.

Best Paper Award 2015

Winner: Yasuhiro Fujiwara, NTT Software Innovation Center; Makoto Nakatsuji, NTT Service Evolution Laboratories; Hiroaki Shiokawa and Takeshi Mishima, NTT Software Innovation Center; Makoto Onizuka, Osaka University
Date: June 2, 2016
Organization: The Institute of Electronics, Information and Communication Engineers (IEICE)

For "Fast Ad-hoc Search Algorithm for Personalized PageRank."
Published as: Y. Fujiwara, M. Nakatsuji, H. Shiokawa, T. Mishima, and M. Onizuka, "Fast Ad-hoc Search Algorithm for Personalized PageRank," IEICE Trans. Inf. & Syst. (Japanese Edition), Vol. J98-D, No. 5, pp. 774–787, May 2015.

Best Paper Award 2015

Winner: Hideya So and Atsuya Ando, NTT Network Innovation Laboratories; Tomohiro Seki, Nihon University; Munenari Kawashima, NTT Intellectual Property Center; Takatoshi Sugiyama, Kogakuin University
Date: June 2, 2016
Organization: IEICE

For "Multiband Sector Antenna with the Same Beamwidth Employing Multiple Woodpile Metamaterial Reflectors."
Published as: H. So, A. Ando, T. Seki, M. Kawashima, and T. Sugiyama, "Multiband Sector Antenna with the Same Beamwidth Employing Multiple Woodpile Metamaterial Reflectors," IEICE Trans. Electron., Vol. E97-C, No. 10, pp. 976–985, Oct. 2014.

IPSJ Fellow

Winner: Katsumi Takahashi, NTT Secure Platform Laboratories
Date: June 3, 2016
Organization: Information Processing Society of Japan (IPSJ)

For his contribution to the development and diffusion of privacy protection technology for the use of personal data.

Outstanding Paper Award

Winner: Ryohei Banno, Susumu Takeuchi, Michiharu Takemoto, and Tetsuo Kawano, NTT Network Innovation Laboratories; Takashi Kambayashi, NTT-AT IPS Corporation; Masato Matsuo, Japan Patent Office
Date: June 3, 2016
Organization: IPSJ

For "Designing Overlay Networks for Handling Exhaust Data in a Distributed Topic-based Pub/Sub Architecture."
Published as: R. Banno, S. Takeuchi, M. Takemoto, T. Kawano, T. Kambayashi, and M. Matsuo, "Designing Overlay Networks for Handling Exhaust Data in a Distributed Topic-based Pub/Sub Architecture," Journal of Information Processing, Vol. 23, No. 2, pp. 105–116, Mar. 2015.

IPSJ Nagao Special Researcher Award

Winner: Yasuhiro Fujiwara, NTT Software Innovation Center
Date: June 3, 2016
Organization: IPSJ

For his pioneering research on efficient mining techniques for big data.

Best Paper Award

Winner: Akihiro Shimoda, Keisuke Ishibashi, and Shigeaki Harada, NTT Network Technology Laboratories; Kazumichi Sato, NTT Communications; Masayuki Tsujino, NTT Network Technology Laboratories; Takeru Inoue, NTT Network Innovation Laboratories; Masaki Shimura, Takanori Takebe, Kazuki Takahashi, Tatsuya Mori, and Shigeki Goto, Waseda University
Date: June 6, 2016
Organization: Technical Committee on Internet Architecture, IEICE Communications Society

For "Inferring the Number of Accesses to Internet Services Using DNS Traffic."
Published as: A. Shimoda, K. Ishibashi, S. Harada, K. Sato, M. Tsujino, T. Inoue, M. Shimura, T. Takebe, K. Takahashi, T. Mori, and S. Goto, "Inferring the Number of Accesses to Internet Services Using DNS Traffic," IEICE Tech. Rep., Vol. 115, No. 307, IA2015-63, pp. 129–134, Nov. 2015.

Best Paper Runner-Up Award

Winner: Richard Chen, Takeru Inoue, Toru Mano, Kimihiro Mizutani, Hisashi Nagata, and Osamu Akashi, NTT Network Innovation Laboratories
Date: June 6, 2016
Organization: Technical Committee on Internet Architecture, IEICE Communications Society

For "Efficient Network Policy Checking with Multi-dimensional Graph Traversal Algorithm."
Published as: R. Chen, T. Inoue, T. Mano, K. Mizutani, H. Nagata, and O. Akashi, "Efficient Network Policy Checking with Multi-dimensional Graph Traversal Algorithm," IEICE Tech. Rep., Vol. 115, No. 256, IA2015-34, pp. 25–30, Oct. 2015.

Distinguished Service Award

Winner: Toshio Norimatsu, NTT Network Service Systems Laboratories
Date: June 21, 2016
Organization: The Telecommunication Technology Committee

For his contribution to the formulation of the standardized specifications for ENUM (E.164 number mapping)/DNS (domain name system) interfaces that enable number portability.

Distinguished Service Award

Winner: Takashi Kotanigawa, NTT Network Service Systems Laboratories
Date: June 21, 2016
Organization: The Telecommunication Technology Committee

For his contribution to the standardization concerning logical interfaces between networks of carriers such as MPSL-TP (multiprotocol label switching - transport profile) and Ethernet.

Papers Published in Technical Journals and Conference Proceedings

Multi-Service Fabric – An Any-vendor SDN Architecture for Service Provider Network

T. Iwai

SDN & OpenFlow World Congress, Düsseldorf, Germany, October 2015.

Many service providers are now investigating the employment of NFV (network functions virtualization). For SDN (software-defined network), however, the scope is usually limited to applications inside their datacenter networks. NTT, who announced the "NetroSphere" concept in which we aim to make maximum use of general-purpose servers and switches for carrier networks, is now challenging to replace the high-end core and edge routers to switch clusters controlled as SDN. We named this architecture as Multi-Service Fabric (MSF) architecture and have been developing the network systems based on the architecture. This architecture targets enabling "any-vendors" to join carrier networks. The presentation covers the architecture, technologies, challenges and the use-cases of MSF.

TMS over V5/hMT+ Disrupts Tactile Direction Discrimination

T. Amemiya, B. Beck, H. Gomi, and P. Haggard

Neuroscience 2015, 156.17, Chicago, IL, USA, October 2015.

Several human imaging studies have found that visual motion area V5/human medial temporal complex (hMT+) responds to tactile motion. A multivariate pattern analysis found specific patterns of activity in V5/hMT+ corresponding to leftward and rightward tactile directions. Some studies have also reported activations in the primary somatosensory cortex (SI) and posterior parietal cortex (PPC) during tactile motion, but they have not established a causal involvement of these areas in tactile direction processing. Here, we created an ecological tactile motion stimulus by varying the direction of a single object moving across the fingertip. We disrupted activity in SI, PPC (Brodmann's areas 7/40) and V5/hMT+ using online double-pulse transcranial magnetic stimulation (TMS) while participants judged tactile motion direction. TMS over both SI and V5/hMT+, but not over PPC, reduced tactile direction discrimination. Our results demonstrate, for the first time, that V5/hMT+ plays a causal role in tactile direction processing, extending previous studies that found directionally sensitive patterns of activity in V5/hMT+. Further, our findings are consistent with a serial model of cortical tactile processing, in which processing by higher-order perceptual areas depends upon the quality of input received from the SI. By contrast, our results do not provide clear evidence that the PPC is causally involved in discriminating tactile direction. This suggests that the pathway for tactile motion processing is not routed through inferior regions of the PPC.

Optical Linear Blending of Viewing Zones Using Convolution of Iris for Smooth Motion Parallax Autostereoscopic 3D Display

T. Kawakami, M. Date, M. Sasai, and H. Takada

Journal of Display Technology, Vol. 12, No. 2, pp. 143–151, February 2016.

A new autostereoscopic three-dimensional (3D) display is proposed. The use of only a small number of projectors and optical linear blending by optical convolution of the iris produces smooth motion parallax and the same depth regardless of viewing positions and interpupillary distance by applying the visual effects of dual edge perception in a depth-fused 3D (DFD) display. This is a breakthrough in overcoming the trade-off between 3D image reality and the number of video sources.

Techniques to Reduce Driving Energy of 1-pixel Displays

H. Manabe, M. Date, H. Takada, and H. Inamura

IEEE Transactions on Industry Applications, Vol. 52, No. 3, pp. 2638–2647, May 2016.

We propose a pair of techniques to lower the energy consumed by driving 1-pixel liquid-crystal displays (LCDs). The first one employs multiple capacitors while the other divides the LCD into two to lower the drive voltage. Simulations show that large capacitance values and many capacitors reduce the energy consumed, and stacking two thin low voltage LCDs maximizes the effect by decreasing the overhead consumed by the microcontroller. Actual polymer-dispersed LCDs (PDLCDs) were tested to confirm that the techniques worked as effectively as the simulations implied. The results show that the overall energy consumption of large PDLCDs is reduced more than 70% using multiple capacitors, and the combination of the two techniques successfully reduces the driving energy even for small LCDs. While the polarity reversal of the proposed technique does incur some delay, it was confirmed by a flicker test that the technique does not degrade image quality.

Optical Diversity Transmission Using WDM Signal and Phase-conjugate Lights through Multi-core Fiber

M. Koga, M. Moroi, and H. Takara

Optics Express, Vol. 24, No. 9, pp. 9340–9352, May 2016.

This paper proposes a maximum-ratio combining (MRC) scheme for a wavelength division multiplexing (WDM) signal and phase-conjugate pair (PCP) diversity transmission to cancel nonlinear phase-shift. A transfer function approximation for nonlinear phase-shift cancellation was formulated. It shows, with the help of numerical calculation, that span-by-span chromatic dispersion compensation is more effective than the lumped equivalent at the receiver. This is confirmed in a 2-core diversity 5-channel WDM transmission experiment over 3 spans of 60-km MCF (multi-core fiber) with 25 Gbit/s-QPSK (quadrature phase-shift keying) PCP. The peak Q-value was enhanced by 3.6 dB through MRC, resulting in a superior bitrate-distance product and optical power density limit compared to twice the single-core transmission.

Progress in LPC-based Frequency-domain Audio Coder

T. Moriya, R. Sugiura, Y. Kamamoto, H. Kameoka, and N. Harada

APSIPA Transactions on Signal and Information Processing, Vol. 5, e11, May 2016.

This paper describes the progress in frequency-domain linear prediction coding (LPC)-based audio coding schemes. Although LPC was originally used only for time-domain speech coders, it has been

applied to frequency-domain coders since the late 1980s. With the progress in associated technologies, the frequency-domain LPC-based audio coding scheme has become more promising, and it has been used in speech/audio coding standards such as MPEG-D unified speech and audio coding and 3GPP (3rd Generation Partnership Project) enhanced voice services since 2010. Three of the latest investigations on the representations of LPC envelopes in frequency-domain coders are shown. These are the harmonic model, frequency-resolution warping, and the Powered All-Pole Spectral Envelope, all of which are aimed at further enhancement of the coding efficiency.

Screen Free Floating 3D Image in a Crystal Ball Using Spatially Imaged Iris and Multiview DFD (Depth Fused 3D) Technologies

M. Date, T. Kawakami, M. Sasai, and H. Takada

Proc. of SID Display Week 2016 Digest, pp. 146–149, San Francisco, CA, USA, May 2016.

A method for displaying clear floating images in a crystal ball is proposed. Its symmetric optics can provide clear and natural 360-degree images with smooth motion parallax in horizontal and vertical directions using the directional selectivity of a spatially imaged iris method and natural 3D (three-dimensional) images of a multiview DFD display.

Flexible SDN Architecture for Carrier Networks

T. Iwai

Proc. of the 4th Annual Network Virtualization & SDN Europe, Madrid, Spain, May 2016.

Beyond NFV/SDN, NetroSphere concept & technologies, flexible SDN network architecture, Multi-Service Fabric (MSF), and the technologies and use cases of MSF are proposed.

Thickness Modulation and Strain Relaxation in Strain-compensated InGaP/InGaP Multiple-quantum-well Structure Grown by Metalorganic Molecular Beam Epitaxy on GaAs (100) Substrate

M. Mitsuhara, N. Watanabe, H. Yokoyama, R. Iga, and N. Shigekawa

Journal of Crystal Growth, Vol. 449, pp. 86–91, June 2016.

We have investigated the structural features of a strain-compensated InGaP/InGaP multiple-quantum-well (MQW) structure on GaAs (100) substrate with a band-gap energy of around 1.7 eV for solar cell applications. In transmission electron microscopy images, noticeable thickness modulation was observed in the barrier layers for a sample grown at the substrate temperature of 530 °C. Meanwhile, the X-ray diffraction patterns indicated that strain relaxation predominantly occurred in the well layers. Decreasing the substrate temperature from 530 to 510 °C was effective in suppressing both the thickness modulation and strain relaxation. Additionally, increasing the growth rate of the well layer further suppressed the thickness modulation. In room-temperature photoluminescence (PL) emission spectra, the sample grown at 510 °C showed approximately 50 times higher PL peak intensity than the one grown at 530 °C.

Single-source AlGaAs Frequency Comb Transmitter for 661 Tbit/s Data Transmission in a 30-core Fiber

H. Hu, F. Da Ros, F. Ye, M. Pu, K. Ingerslev, E. P. Da Silva, Md. Nooruzzaman, Y. Amma, Y. Sasaki, T. Mizuno, Y. Miyamoto, L. Ottaviano, E. Semenova, P. Guan, D. Zibar, M. Galili, K. Yvind, L. K. Oxenløwe, and T. Morioka

Proc. of Conference on Lasers and Electro-Optics, JTh4C.1, San Jose, CA, USA, June 2016.

We demonstrate an AlGaAs-on-insulator nano-waveguide-based frequency comb with high OSNR (optical signal-to-noise ratio) enabling a single source to fully load a 9.6-km heterogeneous 30-core fiber with 661-Tbit/s data achieved by 30xcores, 80xWDM (wavelength division multiplexing), 40 Gbaud, and PDM-16QAM (polarization-division multiplexed 16-level quadrature amplitude modulation).