External Awards

METI-KANSAI Director-General's Award

Winner: Kenta Niwa, Hisashi Uematsu, and Kazunori Kobayashi, NTT Media Intelligence Laboratories
Date: March 27, 2015
Organization: The Kansai Bureau of Economy, Trade and Industry (METI-KANSAI)

For their demonstration of the zoom microphone system, which can pick up target sounds from a distance, at The Lab. in Grand Front Osaka.

IIEEJ Research Encouragement Award

Winner: Shuhei Tarashima, NTT Media Intelligence Laboratories
Date: June 28, 2015
Organization: The Institute of Image Electronics Engineers of Japan (IIEEJ)

For "Fast Web Image Object Cosegmentation with Region Matching."
Published as: S. Tarashima, G. Irie, H. Arai, and Y. Taniguchi, "Fast Web Image Object Cosegmentation with Region Matching," Proc. of Media Computing Conference 2014 (the 42nd Annual Conference of the Institute of Image Electronics Engineers of Japan), R4-2, Tokyo, Japan, Jun. 2014.

IPSJ Yamashita SIG Research Award

Winner: Takeshi Yamamuro, NTT Software Innovation Center
Date: August 3, 2015
Organization: The Information Processing Society of Japan (IPSJ)

For "LZE++: Fast Random Access for Shared Dictionary Compression."
Published as: T. Yamamuro, M. Onizuka, and T. Honjo, "LZE++: Fast Random Access for Shared Dictionary Compression," Proc. of DEIM2015 (the 7th Forum on Data Engineering and Information Management), G3-3, Fukushima, Japan, Mar. 2015 (in Japanese).

Analytical Sciences Hot Article Award

Winner: Yuko Ueno, Kazuaki Furukawa, Andrew Tin, and Hiroki Hibino, NTT Basic Research Laboratories
Date: September 10, 2015
Organization: The Japan Society for Analytical Chemistry

For "On-chip FRET Graphene Oxide Aptasensor: Quantitative Evaluation of Enhanced Sensitivity by Aptamer with a Double-stranded DNA Spacer."

We propose a molecular design for a biomolecular probe to realize an on-chip graphene oxide (GO) aptasensor with enhanced sensitivity. Here, GO works as an excellent acceptor for fluorescence resonance energy transfer. We inserted rigid double-stranded DNA as a spacer between the GO surface and the aptamer sequence to extend the distance between a fluorescence dye and the GO surface during molecular recognition. We examined the dependence of the sensitivity on the length of the spacer quantitatively by using a 2×2 linear-array aptasensor. We used the modified aptamer with 10 and 30 base pair (bp) double-stranded DNA spacers. The signal with a 30-bp spacer was about twice as strong as that with a 10-bp spacer for both thrombin and prostate specific antigen detection. The improvement in the sensitivity was supported by a model calculation that estimated the effect of spacer length on fluorescence recovery efficiency.
Published as: Y. Ueno, K. Furukawa, A. Tin, and H. Hibino, "On-chip FRET Graphene Oxide Aptasensor: Quantitative Evaluation of Enhanced Sensitivity by Aptamer with a Double-stranded DNA Spacer," Analytical Sciences, Vol. 31, No. 9, pp. 875–879, 2015.

Young Scientist Presentation Award

Winner: Kota Okazaki, NTT Nanophotonics Center/NTT Device Technology Laboratories
Date: September 13, 2015
Organization: The Japan Society of Applied Physics (JSAP)

For "A Low-loss SiON Optical Waveguide Fabricated by ECR-PE CVD with SiD_4 Gas."
Published as: K. Okazaki, H. Nishi, T. Tsuchizawa, T. Yamamoto, and K. Yamada, " A Low-loss SiON Optical Waveguide Fabricated by ECR-PE CVD with SiD_4 Gas," Proc. of the 62nd JSAP Spring Meeting 2015, 11p-A16-2, Kanagawa, Japan, Mar. 2015 (in Japanese).

JSAP Young Scientist Award

Winner: Daiki Hatanaka, NTT Basic Research Laboratories
Date: September 13, 2015
Organization: The Japan Society of Applied Physics (JSAP)

For "Mechanical Random Access Memory in a Phonon Circuit."

A phonon waveguide (WG) constructed via a one-dimensional array of mechanical resonators is used to access a localized mechanical resonator. This resonator plays the role of a memory node in which binary information can be written, stored, and read via the mobile mechanical excitations in the phonon WG. The phonon WG-localized resonator architecture demonstrates the viability of mechanical circuits for information processing applications.
Published as: D. Hatanaka, I. Mahboob, K. Onomitsu, and H. Yamaguchi, "Mechanical Random Access Memory in a Phonon Circuit," Appl. Phys. Express, Vol. 7, No. 12, p. 125201, 2014.

Encouragement Award (Industrial Science and Technology Policy and Environment Bureau Director-General's Award) in FY2015 Industrial Standardization Awards

Winner: Takashi Matsui, NTT Access Network Service Systems Laboratories
Date: October 5, 2015
Organization: Ministry of Economy, Trade and Industry

For his supportive role in international standardization activities for IEC (International Electrotechnical Commission) Technical Committee 86 (fibre optics) and the expectation to make further contributions in the future.

Papers Published in Technical Journals and Conference Proceedings

Visual Attention Driven by Auditory Cues: Selecting Visual Features in Synchronization with Attracting Auditory Events

J. Nakajima, A. Kimura, A. Sugimoto, and K. Kashino

Proc. of MMM 2015 (the 21st Anniversary International Conference on MultiMedia Modeling), pp. 74–86, Sydney, Australia, January 2015.

This paper proposes a novel computational model of human visual attention driven by auditory cues. Founded on the Bayesian surprise model that is considered to be promising in the literature, our model uses surprising auditory events to serve as a clue for selecting synchronized visual features and then emphasizes the selected features to form the final surprise map. Our approach to audio-visual integration focuses on using effective visual features alone—but not all available features—for simulating visual attention with the help of auditory information. Experiments using several video clips show that our proposed model can better simulate eye movements of human subjects than other existing models even though our model uses a smaller number of visual features.

Virtual Network Embedding across Multiple Domains with Secure Multi-party Computation

T. Mano, T. Inoue, K. Mizutani, and O. Akashi

IEICE Transactions on Communications, Vol. E98-B, No. 3, pp. 437–448, March 2015.

Network virtualization is a promising technology that can increase flexibility, diversity, and manageability of networks. The concept of building optimal virtual networks across multiple domains is getting much attention, but existing studies are based on the unrealistic assumption that providers' private information can be disclosed; as is well known, providers never actually do that. In this paper, we propose a new method that solves this multi-domain problem without revealing the providers' private information. Our method uses an advanced secure computation technique called multi-party computation (MPC). Although MPC enables existing unsecured methods to optimize virtual networks securely, it requires a very long time to finish the optimization due to the MPC's complex distributed protocols. Our method, in contrast, is designed to involve only a small number of MPC operations to find the optimal solution, and it allows providers to execute a large part of the optimization process.

Analysis of Process Assignment in Multi-tier Mobile Cloud Computing and Application to Edge Accelerated Web Browsing

N. Takahashi, H. Tanaka, and R. Kawamura

Proc. of IEEE Mobile Cloud 2015 (the 3rd IEEE International Conference on Mobile Cloud Computing, Services, and Engineering), pp. 233–234, San Francisco, USA, March/April 2015.

This paper discusses multi-tier mobile cloud computing architecture, where small IT (information technology) servers in the users' proximity are utilized to execute part of the application processing. The partitioning method changes the distribution of processing loads and traffic and affects the processing delay or battery usage. The problem is that it is unclear which partitioning method brings a better result. This paper introduces an abstract model of application execution in a multi-tier mobile cloud, discusses performance metrics, and examines various trade-offs. A prototype named Edge Accelerated Web Browsing is also presented.

Geometric Interpretation of Fisher's Linear Discriminant Analysis through Communication Theory

J. Fujiki, M. Tanaka, H. Sakano, and A. Kimura

Proc. of MVA 2015 (the 14th IAPR International Conference on Machine Vision Applications), pp. 333–336, Tokyo, Japan, May 2015.

This paper provides a geometrical aspect of Fisher's linear discriminant analysis (FLDA), which has been widely used owing to its simple formulation and low computational costs. Our approach is based on a new framework of pattern recognition that can be modeled by communicating class information. This model is quite different from a commonly used framework of pattern recognition as a mapping from the set of patterns to the set of classes. In the new framework, patterns can be regarded as class information with redundant encoding. We show that the geometry of two-class FLDA can be described via a communication theory of noisy channels.

Path Accommodation Design and Reconfiguration for Different Reliability Classes in Virtualized Multi-layer Transport Network

A. Kadohata, T. Tanaka, A. Watanabe, A. Hirano, H. Hasegawa, and K. Sato

Proc. of OECC 2015 (the 20th OptoElectronics and Communications Conference), Shanghai, China, June/July 2015.

We propose differenced accommodation design and reconfiguration in virtualized multi-layer transport networks. Numerical evaluation shows that when the number of classes allowing reconfiguration is dominant, the number of transponders is reduced up to 12%.

Mode Dependent Loss Equaliser and Impact of MDL on PDM-16QAM Few-mode Fibre Transmission

T. Mizuno, H. Takara, K. Shibahara, Y. Miyamoto, M. Oguma, H. Ono, Y. Abe, T. Matsui, S. Matsuo, K. Saitoh, and Y. Kimura

Proc. of the 41st European Conference on Optical Communication (ECOC 2015), Valencia, Spain, September/October 2015.

We experimentally evaluate the relationship between mode dependent loss (MDL) and Q penalty for few-mode fibre transmission. We employ a low-MDL recirculating loop and free-space optics type MDL equaliser and transmit 3-mode signals with PDM (polarization-division multiplexed)-16QAM(quadrature amplitude modulation).

Dense Space Division Multiplexing Long Haul Transport System Using Multi-core / Multi-mode Fibre

T. Mizuno, H. Takara, A. Sano, and Y. Miyamoto

Proc. of ECOC 2015, Valencia, Spain, September/October 2015.

We review recent dense space division multiplexing (DSDM) transmission technologies for multi-core/multi-mode fibre and discuss issues toward future DSDM long haul transport systems.

Pre-adjustment Rerouting for Wavelength Defragmentation in Optical Transparent WDM Networks

A. Kadohata, A. Watanabe, A. Hirano, H. Hasegawa, and K. Sato

IEICE Transactions on Communications, Vol. E98-B, No. 10, pp. 2014–2021, October 2015.

We propose a new extension to reconfiguration algorithms used to address wavelength defragmentation to enhance the path accommodation efficiency in optical transparent wavelength division multiplexing networks. The proposed algorithm suppresses the number of fibers employed to search for a reconfigurable wavelength channel by combining routes between the target path and the existing path in a reconfigured wavelength channel. This paper targets three main phases in reconfiguration: i) the reconfiguration trigger; ii) redesign of the wavelength path; and iii) migrating the wavelength paths. The proposed and conventional algorithms are analyzed from the viewpoints of the number of fibers, the accommodation rate, and the number of migrating sequences. Numerical evaluations show that the number of fibers is suppressed by 9%, and that the accommodation efficiency is increased by approximately 5–8% compared to when reconfiguration is not performed.

Acoustic Event Detection in Speech Overlapping Scenarios Based on High Resolution Spectral Input and Deep Learning

M. Espi, M. Fujimoto, and T. Nakatani

IEICE Transactions on Information and Systems, Vol. E98-D, No. 10, pp. 1799–1807, October 2015.

Acoustic event detection techniques are typically based on derived features that reduce resolution and detail when we are targeting other kinds of events. We propose a method that learns features in an unsupervised manner from high resolution spectrogram patches, and integrates within the deep neural network framework to detect and classify acoustic events.

Adaptive Post-filtering Method Controlled by Pitch Frequency for CELP-based Speech Coding

H. Chiba, Y. Kamamoto, T. Moriya, N. Harada, S. Miyabe, T. Yamada, and S. Makino

IEICE Transactions on Information and Systems (Japanese Edition), Vol. J98-D, No. 10, pp. 1301–1311, October 2015.

Most speech codecs utilize a post-filter that emphasize pitch structures to enhance perceptual quality at the decoder. Particularly, the bass post-filter used in ITU-T G.718 performs a pitch enhancement technique for a lower fixed frequency band. This paper describes a new post-filtering method which adaptively controls the frequency band and the gain of the post-filter frame-by-frame depending on the pitch frequency of the decoded signal to improve the quality. We have confirmed the enhancement of the speech quality with the developed method through objective and subjective evaluations. This devised technology can be easily applied to most of CELP-based speech codecs.

Comparison of the Photodegradation Behavior of LDPE Using Accelerated Weathering Instruments

T. Miwa, Y. Takeshita, Y. Akage, M. Watanabe, M. Takaya, and T. Sawada

Corrosion Engineering, Vol. 64, No. 4, pp. 99–106, October 2015.

Samples of low-density polyethylene (LDPE) were photodegraded using accelerated weathering instruments and outdoor exposure. The physical properties and chemical structures of the photodegraded samples were studied through a tensile test, gel chromatography, and infrared spectroscopy. The molecular weight distribution of a sample photodegraded by using a fluorescent ultraviolet lamp at a high black panel temperature (80°C) was more similar to that of an outdoor-degraded sample than that of other artificially samples photodegraded by using a xenon lamp at the standard black panel temperature (63°C). It is estimated that accelerated weathering tests at a high sample temperature can accelerate cross-linking more than chain scission, consequently recreating molecule-enlargement in a similar way to the outdoor-degraded sample.

Optical DP-high Order-QAM Transmission System for High-speed Short Links Utilizing Copropagating Twin Local Lights

H. Kawakami, T. Kobayashi, and Y. Miyamoto

Proc. of the 21st Asia-Pacific Conference on Communications (APCC2015), pp. 94–97, Kyoto, Japan, October 2015.

A novel optical high order quadrature amplitude modulation (QAM) transmission system for high-speed short links is described. Dual-polarization (DP) QAM and twin local lights are generated from one light source in the system, and these light waves are simultaneously transmitted via standard single-mode fiber. The receiver can be constructed simply because it does not require a coherent light source under wavelength control. The system enables a 3.1-Gbaud DP-16-QAM signal to be successfully demodulated after 80-km transmission without using an optical dispersion compensator. It also achieves high tolerance against phase noise in the signal light source.

High Capacity Dense SDM Transmission Using Multi-core Few-mode Fiber

T. Mizuno, H. Takara, A. Sano, and Y. Miyamoto

Proc. of the 2015 IEEE Photonics Conference, Virginia, USA, pp. 259–260, October 2015.

We review recent progress in space division multiplexed (SDM) transmission, and our proposal and the first demonstration of dense space division multiplexing (DSDM) towards ultra-high capacity optical transport systems.

Comparison of Subscriber Assignment Methods on Scalable Distributed Pub/Sub Systems

R. Banno, T. Kawano, S. Takeuchi, M. Takemoto, and M. Matsuo

Proc. of APCC2015, pp. 632–636, Kyoto, Japan, October 2015.

Scalable messaging methods for IoT services are needed to accommodate a vast number of devices. Skip Graph based, topic based pub/sub (SG-TPS), which utilizes multiple brokers composing a structured overlay network, is a promising candidate. In SG-TPS, the distribution delay time is widely influenced by the way subscribers are assigned to each broker. There are two possible approaches:

intensive assignment, by which subscribers having the same topic are accommodated on the same broker, and extensive assignment, by which the subscribers are accommodated on different brokers as far as possible. In this paper, we formulate the difference in the distribution delay time between these two approaches and discuss optimization of subscriber assignment.

Identifying Attractive News Headlines for Social Media

S. Kourogi, A. Kimura, H. Fujishiro, and H. Nishikawa

Proc. of CIKM 2015 (the 24th ACM International Conference on Information and Knowledge Management), Melbourne, Australia, pp. 1859–1862, October 2015.

This paper provides a novel solution to this problem by identifying attractive headlines as a gateway to news articles. We performed one of the first investigations of news headlines on a major viral medium. Using our investigation as a basis, we also propose a learning-to-rank method that suggests promising news headlines. Our experiments with 2000 news articles demonstrate that our proposed method can accurately identify attractive news headlines from the candidates and reveals several promising factors in making news articles go viral.

Linewidth-tolerant Dual Polarization QAM Transmission System Using Twin Local Lights

H. Kawakami, T. Kobayashi, and Y. Miyamoto

IEEE Photonics Technology Letters, Vol. 27, No. 22, pp. 2375–2378, November 2015.

A novel digital coherent transmission system based on dual polarization quadrature amplitude modulation (DP-QAM) is proposed. In this system, a DP-QAM signal and twin local lights are generated from one continuous wave (CW) light source and transmitted simultaneously. Because optical phase noise is canceled in the proposed receiver, linewidth tolerance is improved without using a coherent light source in the receiver. The proposed scheme successfully demodulates a 3.125-GBd DP-quadrature phase shift keying (i.e., DP-4-QAM) signal. After 50-km transmission, no degradation in bit error rate was observed even at the linewidth of 45 MHz.
