

External Awards

Photonics in Switching 2015 Best Paper Award

Winner: Salah Ibrahim, Tatsushi Nakahara, Hiroshi Ishikawa, and Ryo Takahashi, NTT Device Technology Laboratories

Date: September 24, 2015

Organization: Photonics in Switching 2015 Committee

For “An Ultralow-power Optical Label Processor for 100-Gbps Optical Packet Switching.”

A novel label processor subsystem for 100-Gbps (25-Gbps \times 4 Lambdas) burst-mode optical packets has been developed with a significant reduction of power consumption and latency, based on an enhanced optoelectronic serial-to-parallel converter and a novel optical-trigger-pulse generator that consists of a semiconductor optical amplifier and a single-chip optoelectronic integrated circuit high-speed current driver.

Published as: S. Ibrahim, T. Nakahara, H. Ishikawa, and R. Takahashi, “An Ultralow-power Optical Label Processor for 100-Gbps Optical Packet Switching,” Proc. of Photonics in Switching 2015, ThII2-4, Florence, Italy, Sept. 2015.

APCC2015 Best Paper Award

Winner: Kazuhisa Yamada, NTT Network Innovation Laboratories; Akihiro Nakao, the University of Tokyo; Yasushi Kanada, Hitachi, Ltd.; Yoshinori Saida, NEC Corporation; and Koichiro Amamiya, Fujitsu Laboratories Ltd.

Date: October 15, 2015

Organization: APCC2015 (21st Asia-Pacific Conference on Communications) Award Committee

For “VNode Infrastructure Enhancement - Deeply Programmable Network Virtualization.”

Published as: K. Yamada, A. Nakao, Y. Kanada, Y. Saida, and K. Amamiya, “VNode Infrastructure Enhancement - Deeply Programmable Network Virtualization,” Proc. of APCC2015, Kyoto, Japan, Oct. 2015.

WCSP 2015 Best Paper Award

Winner: Keisuke Sato, Yuichi Kawamoto, Hiroki Nishiyama, Nei Kato, Graduate School of Information Sciences, Tohoku University; and Yoshitaka Shimizu, NTT Network Innovation Laboratories

Date: October 16, 2015

Organization: WCSP 2015 (7th International Conference on Wireless Communications and Signal Processing)

For “A Modeling Technique Utilizing Feedback Control Theory for Performance Evaluation of IoT System in Real-time.”

In this paper, we focus on the modeling aspect for evaluating the performance of a real-time Internet of Things (IoT) system. Specifically, our proposed model is constructed by utilizing feedback control theory.

Published as: K. Sato, Y. Kawamoto, H. Nishiyama, N. Kato, and Y. Shimizu, “A Modeling Technique Utilizing Feedback Control Theory for Performance Evaluation of IoT System in Real-time,” Proc. of WCSP 2015, Nanjing, China, Oct. 2015.

IEEE Photonics Society Japan Chapter Young Scientist Award

Winner: Satomi Katayose, NTT Device Technology Laboratories

Date: October 28, 2015

Organization: IEEE Photonics Society Japan Chapter

For “1 \times 8 Silicon-silica Hybrid Thermo-optic Switch with Multi-chip Configuration Based on Optical Phased Array.”

Published as: S. Katayose, Y. Hashizume, and M. Itoh, “1 \times 8 Silicon-silica Hybrid Thermo-optic Switch with Multi-chip Configuration Based on Optical Phased Array,” Proc. of MOC’15 (the 20th Microoptics Conference), Fukuoka, Japan, Oct. 2015.

ISPACS 2015 Best Paper Award

Winner: Takayuki Nakachi and Tatsuya Fujii, NTT Network Innovation Laboratories

Date: November 11, 2015

Organization: ISPACS 2015 (The 2015 International Symposium on Intelligent Signal Processing and Communication Systems) Technical Program Committee

For “Layered Lossless Video Coding Based on Slepian-Wolf Theorem.”

Published as: T. Nakachi and T. Fujii, “Layered Lossless Video Coding Based on Slepian-Wolf Theorem,” Proc. of ISPACS 2015, pp. 652–657, Bali, Indonesia, Nov. 2015.

Papers Published in Technical Journals and Conference Proceedings

Verifying Power Distribution Network with ZDDs

T. Inoue, N. Yasuda, S. Kawano, Y. Takenobu, S. Minato, and Y. Hayashi

Proc. of ISMP 2015 (the 22nd International Symposium on Mathematical Programming), Pittsburg, USA, July 2015.

Power distribution networks should be restored by reconfiguring switches automatically, given that several feeders are interrupted in a severe accident. The network's design has to guarantee that it is restorable under any possible failure, but it is a computationally hard task to examine all possible failures. This paper proposes a novel ZDD (zero-suppressed binary decision diagram) method to find all the critical (unrestorable) line cuts with great efficiency to verify the network design. The method includes a fast screening algorithm based on hitting set enumeration, which is often used in data-mining. Thorough experiments reveal that the proposed method can find thousands of unrestorable cuts from the trillions of possible cuts in a large 432-Bus network.

Stable Load Balancing with Overlapping ID-space Management in Range-based Structured Overlay Networks

K. Mizutani, T. Inoue, T. Mano, O. Akashi, S. Matsuura, and K. Fujikawa

Computer Software, Vol. 32, No. 3, pp. 101–110, August 2015.

This paper proposes a novel scheme that distributes, fairly, the loads without node migration and with little data reallocation, by sharing some identification (ID)-space regions between neighboring nodes. Our overlapping ID-space management scheme derives the optimal overlap based on kernel density estimations; the query loads based on the statistical theory are used to calculate the best overlap regions. This calculation is executed in a distributed manner with no central coordinator. We conduct thorough computer simulations, and show that our scheme alleviates the worst node load by 20–90% against existing techniques without node migration and with the least data reallocation.

Viewpoint Image Generation for Head Tracking 3D Display Using Multi-camera and Approximate Depth Information

M. Date, H. Takada, and A. Kojima

Journal of SID, Vol. 23, No. 8, pp. 340–346, August 2015.

A simple and high image quality method for viewpoint image synthesis from multi-camera images for a stereoscopic 3D display using head tracking is proposed. In this method, slices of images for depth layers are made using approximate depth information, the slices are linearly blended corresponding to the distance between the viewpoint and cameras at each layer, and the layers are overlaid from the perspective of viewpoint. Because the linear blending automatically compensates for depth error because of the visual effects of depth-fused 3D (DFD), the resulting image is natural to the observer's perception. Smooth motion parallax of wide depth range objects induced by viewpoint movement for left-and-right and front-and-back directions is achieved using multi-camera images and approximate depth information. Because the calculation algorithm is very simple, it is suitable for real time 3D display applications.

Novel Applications of and Experiments on Programmable Infrastructures

Y. Minami and K. Yamada

Proc. of MASONS (IEEE International Workshop on Manageability and Security of Network Function Virtualization and Software Defined Network) 2015, Las Vegas, USA, August 2015.

We show novel applications as use cases and experiment results on programmable infrastructures. We realized multicast streaming and adaptive bit rate streaming by automatically deploying video processing functions in a slice. Experimental results showed that we can enhance service functionalities and use resources efficiently with programmable infrastructures.

Low Power Driving Techniques for 1-pixel Displays

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

Proc. of IAS 2015 (the 50th IEEE Industry Applications Society Annual Meeting), 2015-ILDC-0339, Dallas, USA, October 2015.

Two techniques to reduce the power needed for driving 1-pixel LCDs (liquid crystal displays) are proposed. The first one is the use of multiple capacitors, and the second is dividing the LCD into two to lower the drive voltage. Simulations show that large capacitance and many capacitors can reduce the power, and stacking two thin LCDs driven by lower voltage maximizes the effect of the proposed technique, especially for small LCDs. An experiment on the former technique using actual PDLCDs (polymer dispersed liquid crystal displays) confirms that it works as effectively as the simulation implies. The overall energy consumption of large PDLCDs is reduced more than 70%.

Development of a Handset for NGN Wideband Telephone Service Trial

M. Okamoto, K. Noguchi, Y. Hiwazaki, and Y. Haneda

The Journal of the Acoustical Society of Japan, Vol. 71, No. 11, pp. 581–589, November 2015 (in Japanese).

Since 2008, a high-quality IP telephone service has been provided over a Next Generation Network (NGN) developed by Nippon Telegraph and Telephone Corporation (NTT) Group of Japan. Prior to the commencement of service provision, a wideband telephone handset was developed on an experimental basis and tested in a field trial to verify service validity. The handset demonstrated improved characteristics over those of conventional telephone handsets.

Low-power Driving Technique for 1-pixel Display Using an External Capacitor

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

IEICE Transactions on Electronics, Vol. E98-C, No. 11, pp. 1015–1022, November 2015.

Liquid crystal displays (LCDs) are suitable as elements underlying wearable and ubiquitous computing thanks to their low power consumption. A technique that uses less power to drive 1-pixel LCDs is proposed. It harvests the charges on the LCD and stores them in an

external capacitor for reuse when the polarity changes. A simulation shows that the charge reduction depends on the ratio of the capacitance of the external capacitor to that of the LCD and can reach 50%. An experiment on a prototype demonstrated an almost 30% reduction with large 1-pixel LCDs. With a small 10 x 10 mm² LCD, the overhead of the micro-controller matched the reduction, so no improvement could be measured. Though the technique requires longer time for polarity reversal, we confirm that it does not significantly degrade visual quality.

Network Clock System that Ensures a High Level of Frequency Accuracy

S. Fujikawa

IEICE Transactions on Communications, Vol. E98-B, No. 11, pp. 2212–2226, November 2015.

This paper proposes a network clock system that detects degradation in the frequency accuracy of network clocks distributed across a network and finds the sources of the degradation. This system uses two factors to identify degradation in frequency accuracy and an algorithm that finds degradation sources by integrating and analyzing the evaluation results gathered from the entire network.

Differential Reliability Path Accommodation Design and Reconfiguration in Virtualized Multi-layer Transport Network

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

IEICE Transactions on Communications, Vol. E98-B, No. 11, pp. 2151–2159, November 2015.

In this paper, we propose differentiated reconfiguration to address the trade-off relationship between accommodation efficiency and disruption risk in virtualized multi-layer transport networks. The reconfiguration considers service classes defined as a combination of including or excluding a secondary path and allowing or not allowing reconfiguration. To implement the proposed network, we propose a multi-layer redundant path accommodation design and reconfiguration algorithm. A reliability evaluation algorithm is also introduced. Numerical evaluations show that when all classes are divided equally, the equipment cost can be reduced by approximately 6%. The proposed reconfigurable networks are shown to be a cost-effective solution that maintains reliability.

Real-time Robust Formant Estimation System Using a Phase Equalization-based Autoregressive Exogenous Model

H. Oohashi, S. Hiroya, and T. Mochida

Acoustical Science and Technology, Vol. 36, No. 6, pp. 478–488, November 2015.

This paper presents a real-time robust formant tracking system for speech using a real-time phase equalization-based autoregressive exogenous model (PEAR) with electroglottography (EGG). Although linear predictive coding (LPC) analysis is a popular method for estimating formant frequencies, it is known that the estimation accuracy for speech with high fundamental frequency F_0 would be degraded since the harmonic structure of the glottal source spectrum deviates more from the Gaussian noise assumption in LPC as its F_0 increases. In contrast, PEAR, which employs phase equalization and LPC with an impulse train as the glottal source signals, estimates formant fre-

quencies robustly even for speech with high F_0 . However, PEAR requires higher computational complexity than LPC. In this study, to reduce this computational complexity, a novel formulation of PEAR was derived, which enabled us to implement PEAR for a real-time robust formant tracking system. In addition, since PEAR requires timings of glottal closures, a stable detection method using EGG was devised. We developed the real-time system on a digital signal processor and showed that for both the synthesized and natural vowels, the proposed method can estimate formant frequencies more robustly than LPC against a wider range of F_0 .

Mode-selective Coherent Detection Technique for Low-complexity Mode Division Multiplexing Systems

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

Electronics Letters, Vol. 51, No. 23, pp. 1899–1900, November 2015.

The mode division multiplexing (MDM) signal transmitted in an optical multimode fibre link is usually received with multiple coherent receivers (RXs), resulting in an increase in RX system scale. A mode-selective coherent detection technique is proposed based on MDM-to-frequency division multiplexing (FDM) signal conversion scheme using an MDM and FDM local oscillator. The proposed technique uses only a single coherent RX to detect the MDM signal to achieve low-complexity MDM systems. The proposed mode-selective coherent detection technique is also experimentally shown. The experimental results show that a single coherent RX successfully receives the MDM signal.

Impacts of Burst Disturbance on Throughput and Connection Quality of ADSL System

K. Ono, K. Okamoto, H. Tatemichi, and K. Takaya

Proc. of KJJC-2015 (2015 Korea-Japan EMT/EMC/BE Joint Conference), pp. 227–230, November 2015.

The relationship between duration of burst disturbances and the throughput/connection quality of digital communication was investigated in order to evaluate the impact of burst disturbances. In this paper, the impacts of the duration of burst disturbances with fixed frequency on Receive Bit Rate (RBR) and applied levels of burst disturbances causing Asymmetric Digital Subscriber Line (ADSL) reconnection were evaluated experimentally. As a result, it has been clarified that the RBR of an ADSL changes in accordance with the increased number of disturbed ADSL frames in response to the increased duration of burst disturbance, and ADSL reconnection tends to occur even if the applied level of burst disturbance is small because of the increased number of disturbed ADSL frames in response to the increased duration of burst disturbance.

Optically Observed Imbibition and Drainage of Wetting Fluid in Nanoporous Vycor Glass

S. Ogawa and J. Nakamura

Journal of the Optical Society of America A, Vol. 32, No. 12, pp. 2397–2406, December 2015.

The light scattering and absorption of nanoporous Vycor glass during imbibition and drainage of water exhibit the hysteresis of the white turbidity in the visible region and that of the absorbance peak in the near-infrared region. We analyzed the effect of changing humidity on each of the hystereses. The effect of changing humidity

up to various values of maximum attained humidity on both hystereses showed that the amount of water in pores determines unsaturated optical hystereses in both regions.
