

External Awards

Young Researcher's Award

Winner: Hisashi Kurasawa, NTT Network Innovation Laboratories

Date: February 17, 2015

Organization: The Institute of Electronics, Information and Communication Engineers (IEICE)

For "Evaluation of the Estimation for Missing Sensor Values Using a Field Trial."

Published as: H. Kurasawa, Y. Fujii, H. Sato, A. Yamamoto, H. Kawasaki, M. Nakamura, M. Kamiya, A. Tsutsui, and T. Miyazaki, "Evaluation of the Estimation for Missing Sensor Values Using a Field Trial," Proc. of the 2014 IEICE General Conference, B-18-48, Niigata, Japan, Mar. 2014 (in Japanese).

IEICE Information Network Research Award

Winner: Takeru Inoue, Toru Mano, Kimihiro Mizutani, NTT Network Innovation Laboratories; Shin-ichi Minato, Hokkaido University; Osamu Akashi, NTT Network Innovation Laboratories

Date: March 2, 2015

Organization: Technical Committee on Information Network, IEICE

For "Packet Classification for Global Network View of SDN with MDDs."

In software-defined networking, applications are allowed to access a global view of the network so as to provide sophisticated functionalities. They commonly rely on packet classification, but unlike the conventional classification problem of searching for the action taken at a single switch, the global network view requires them to identify the network-wide behavior of the packet. Conventional classification methods, however, fail to well support network-wide behaviors, since the search space is complicatedly partitioned.

This paper proposes a novel packet classification method that efficiently supports network-wide packet behaviors. Our method utilizes a compressed data structure named the multi-valued decision diagram, allowing it to manipulate the complex search space with several algorithms. Experiments with real network datasets show that our method identifies the packet behavior at 20.1 Mpps on a single CPU core with only 8.4 MB memory.

Published as: T. Inoue, T. Mano, K. Mizutani, S. Minato, and O. Akashi, "Packet Classification for Global Network View of SDN with MDDs," IEICE Technical Report, Vol. 114, No. 207, IN2014-50, pp. 1–6, Sept. 2014 (in Japanese).

Young Researcher's Award

Winner: Kazumitsu Sakamoto, NTT Network Innovation Laboratories

Date: March 11, 2015

Organization: IEICE

For "Reduction Effect of the Number of Quantization Bits Required in ADC by MIMO Detection before AD Conversion" and "Experimental Evaluation of Broadband Short-range MIMO Transmission Using Simple Decoding Method."

Young Researcher's Award

Winner: Maki Arai, NTT Network Innovation Laboratories

Date: March 11, 2015

Organization: IEICE

For "Study on Higher Modes of Antennas for MIMO Transmission by Orthogonal Directivities" and "Experimental Study on Higher-order-mode Antennas for Simple Spatial Division Transmission."

Published as: M. Arai, T. Seki, K. Hiraga, K. Sakamoto, H. Toshinaga, T. Nakagawa, and K. Uehara, "Study on MIMO Transmission Using Orthogonal Directivities Obtained from Higher Order Microstrip Antenna Modes," Electronics Letters, Vol. 50, No. 7, pp. 562–564, Mar. 2014.

Maejima Hisoka Award

Winner: Masahito Tomizawa, NTT Network Innovation Laboratories; Hiroshi Onaka, Fujitsu Limited; Takashi Mizuochi, Mitsubishi Electric Corporation; and Kiyoshi Fukuchi, NEC Corporation

Date: March 20, 2015

Organization: The Tsushinbunka Association

For "Research and Development on Fast Wavelength Switching Digital Coherent Technology for 100G Optical Network."

Papers Published in Technical Journals and Conference Proceedings

Unsupervised Non-parametric Bayesian Modeling of Non-stationary Noise for Model-based Noise Suppression

M. Fujimoto, Y. Kubo, and T. Nakatani

Proc. of 2014 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), pp. 5562–5566, Florence, Italy, May 2014.

The accurate modeling of non-stationary noise plays an important role in model-based noise suppression for noise robust speech recognition. We have already proposed methods for unsupervised noise modeling with a Gaussian mixture model or a hidden Markov model by using a minimum mean squared error estimate of the noise. However, our previous work fixed the structure of the noise model empirically without any consideration of noise characteristics; thus, optimization of the noise model structure is required if we are to obtain further improvements. Although the Bayesian information criterion (BIC) has been widely used as a conventional approach to model structure estimation, it is not always the optimal criterion. Therefore, this paper presents a way of modeling non-stationary noise with a non-parametric Bayesian approach that estimates the model structure depending on the characteristics of given observations. The proposed method provided improved results for the evaluations of two different speech recognition tasks compared with results obtained using the conventional BIC-based approach.

A Cross-layer Switching of OFDMA and MU-MIMO for Future WLAN Systems

T. Murakami, Y. Takatori, M. Mizoguchi, and F. Maehara
IEICE Communications Express, Vol. 3, No. 9, pp. 263–268, September 2014.

We propose a cross-layer switching method of orthogonal frequency division multiple access (OFDMA) and multiuser multiple input multiple output (MU-MIMO) for future wireless local area network (WLAN) systems. The proposed method, employed on the medium access control layer, switches between OFDMA and MU-MIMO as the transmission method after processing by using physical layer information such as an overhead of channel state information feedback, station number, and data length in order to improve the transmission efficiency. Simulation results show that the proposed method achieves higher total throughput than conventional OFDMA or MU-MIMO where switching is not performed.

Dual-band Nested Waveguide Antenna Employing Frequency-selective Surfaces

H. So, A. Ando, and T. Sugiyama
Proc. of 2014 IEEE International Symposium on Antennas and Propagation Society, pp. 2080–2081, Memphis, USA, July 2014.

This paper proposes a waveguide antenna that employs frequency-selective surfaces (FSSs). The proposed antenna nests one waveguide inside the other. The top surface of one waveguide acts as the top surface of the other. Waveguide walls are formed by FSSs, which reflect electromagnetic waves at each frequency band. An example implementation of this proposal, described in this paper, is a waveguide antenna designed to radiate at 2 GHz and 4 GHz. Electromagnetic field simulation results demonstrate that the fractional bandwidth is 29% (2 GHz) and 16% (4 GHz) for VSWR values under 2.0. The radiation patterns of the proposed dual-band waveguide antenna match well those of the corresponding single-band waveguide antennas, and the peak gain of each frequency band is the same.

Multiband Sector Antenna with the Same Beamwidth Employing Multiple Woodpile Metamaterial Reflectors

H. So, A. Ando, T. Seki, M. Kawashima, and T. Sugiyama
IEICE Transactions on Electronics, Vol. E97-C, No. 10, pp. 976–985, October 2014.

This paper proposes a sector base station antenna for mobile wireless communication systems employing multiple woodpile metamaterial reflectors and a multiband radiator that establishes the same beamwidth in the horizontal plane for more than two frequency bands. Electromagnetic band gap (EBG) characteristics of each metamaterial reflector can be controlled through structural parameters of the woodpile reflector, e.g., the rod width and rod spacing. A design for a triple-frequency-band antenna that radiates at 800 MHz, 2 GHz, and 4 GHz is shown as an example of the proposed antenna. The algorithm used to adjust the beamwidth of the proposed antenna is newly introduced and adjusts the beamwidth to be the same for each band using the rod width of the woodpile. A prototype of the proposed antenna has the approximately 90° beamwidth in the horizontal plane at the three frequencies, and the measurement results agree well with the electromagnetic field simulation results.

Spatial Division Transmission without Signal Processing for MIMO Detection Utilizing Two-ray Fading

K. Hiraga, K. Sakamoto, M. Arai, T. Seki, T. Nakagawa, and K. Uehara

IEICE Transactions on Communications, Vol. E97-B, No. 11, pp. 2491–2501, November 2014.

This paper presents a spatial division (SD) transmission method based on two-ray fading that dispenses with the high signal processing cost of multiple-input and multiple-output (MIMO) detection and antennas with narrow beamwidth. We show the optimum array geometries as functions of the transmission distance for providing a concrete array design method. Moreover, we clarify achievable channel capacity considering reflection coefficients that depend on the polarization, incident angle, and dielectric constant.

Online Gain Update for Manual Following Response Accompanied by Gaze Shift during Arm Reaching

N. Abekawa and H. Gomi

Journal of Neurophysiology, Vol. 113, No. 4, pp. 1206–1216, November 2014.

Visual motion applied during a reaching movement induces a rapid and automatic manual following response (MFR) in the direction of the visual motion. The MFR amplitude is modulated by the gaze direction relative to the reach target location (i.e. foveal or peripheral reaching). However, the time or state point at which the brain specifies this visuomotor gain remains unclear. In the present study, we measured MFR amplitudes during a task where the participant performed a saccadic eye movement that altered the gaze-reach coordination during reaching. The results indicate that the MFR amplitude immediately after the saccade termination changed according to the new gaze-reach coordination, suggesting a flexible online updating of the MFR gain during reaching. Our findings suggest that the brain flexibly updates the visuomotor gain for an online controller even during reaching movements based on continuous monitoring of the gaze-reach coordination.

Emphasized Accent Phrase Prediction from Text for Advertisement Text-To-Speech Synthesis

H. Nakajima, H. Mizuno, and S. Sakauchi

Proc. of PACLIC 28 (28th Pacific Asia Conference on Language, Information and Computation), pp. 170–177, Phuket, Thailand,

December 2014.

Realizing expressive text-to-speech synthesis requires both text processing and the rendering of natural expressive speech. This paper focuses on the former as a front-end task in the production of synthetic speech and investigates a novel method for predicting emphasized accent phrases from advertisement text information. For this purpose, we examine features that can be accurately extracted by text processing based on current text-to-speech synthesis technologies.

SFB: A Scalable Method for Handling Range Queries on Skip Graphs

R. Banno, T. Fujino, S. Takeuchi, and M. Takemoto

IEICE Communications Express, Vol. 4, No. 1, pp. 14–19, January 2015.

Skip graph is a promising candidate algorithm for large scale distributed systems. The principal feature is range query functionality, but skip graph does not have a definite method of multicasting inside ranges designated by query issuers. Even though several simple ways can be considered, they are inefficient regarding the latency or traffic volume. In this letter, we first introduce multi-range forwarding (MRF) used in multi-key skip graph. MRF can be used even in normal skip graph, and is efficient compared to the simple ways. Second, we propose a method named split-forward broadcasting (SFB). We analytically evaluate SFB and explain that SFB can roughly halve the average number of hops of MRF.

Spatiotemporal Analysis of Rambling Activities: Approach to Inferring Visitor Satisfaction

M. Ohta, Y. Watanabe, and T. Miyazaki

Proc. of ENTER2015, pp. 551–563, Lugano, Switzerland, February 2015.

A method for investigating trajectories of rambling objects is proposed. The goal of this study is to infer persons' satisfactions with their experiences using their trajectories. Two aspects of rambling activities: multi-stop and multi-purpose trips, and unplanned stopping-by at destinations are examined by mathematical knot theory.

Resolution Warped Spectral Representation for Low-delay and Low-bit-rate Audio Coder

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

IEEE Transactions on Audio, Speech, and Language Processing, Vol. 23, No. 2, pp. 288–299, February 2015.

Vol. 23, No. 2, pp. 288–299, February 2015.

We have devised a high-quality frequency-domain audio coder based on the state-of-the-art monaural wide-band coder aiming at its use in low-delay and low-bit-rate conditions. The coder efficiently represents frequency spectral envelopes of the target signals with low computational complexity using optimally prepared non-negative sparse matrices. The experimental results reveal that this representation has positive effects on the objective and subjective quality of the coder resulting in the comparable quality to the same bit rate of 3GPP Extended Adaptive Multi-Rate WideBand (AMR-WB+), a coder which permits more than four times longer delay compared with the proposed coder. Consequently, this coder is suitable for applications in mobile communications, which require low delay and low complexity.

Sub-lambda and Wavelength Path Reconfiguration in Multi-layer Transport Networks

A. Kadohata, A. Watanabe, and A. Hirano

Journal of Optical Communications and Networking, Vol. 7, No. 3, pp. A432–A439, March 2015.

We investigate adaptive reconfiguration of sub-lambda and wavelength paths to deal with unpredictable traffic demands. To accommodate traffic effectively, wavelength paths need to be reconfigured cooperatively with sub-lambda paths while minimizing the number of migration sequences. Therefore, we propose a scheme for sub-lambda and wavelength path reconfiguration based on wavelength resource management in multi-layer transport networks. Three steps comprise the proposed scheme: wavelength resource management, reconfiguration trigger, and reconfiguration. First, management of the number of wavelength paths that can be accommodated between all node pairs is calculated for each path accommodated. Second, if that number is less than the threshold value set in advance for some node pair, reconfiguration is performed. Third, the sub-lambda and wavelength paths are reconfigured. In this scheme, we also propose a sub-lambda path reconfiguration algorithm that reconfigures multi-hop sub-lambda paths to single-hop paths first, and two wavelength path reconfiguration algorithms that reduce wavelength fragmentation and the number of migration sequences considering the accommodation rate. Numerical evaluation shows that the number of fibers is suppressed by 12%–14% and that the equipment cost is reduced by approximately 8%–9% compared to when no reconfiguration is used. The results also show that the number of migration sequences for the wavelength defragmentation algorithms is reduced by approximately 23%–35% compared to that for the conventional algorithm.