External Awards

COIN2012 IEEE ComSoc JC Young Engineer Award
Winner: Takafumi Tanaka, NTT Network Innovation Laboratories
Date: May 31, 2012
Organization: IEEE Communications Society Japan Chapter

For "Comparative Study of Optical Networks with Grid Flexibility and Traffic Grooming".

We comparatively investigated different optical network architectures characterized by grid flexibility and sub-wavelength traffic grooming. Simulation shows that the elastic models are more effective than fixed-grid models in terms of spectrum efficiency, but the trade-off between grooming gain and its additional cost should be considered, especially in elastic models.

Published as: T. Tanaka, A. Hirano, and M. Jinno, "Comparative Study of Optical Networks with Grid Flexibility and Traffic Grooming," Proc. of the 10th International Conference on Optical Internet (COIN2012), Yokohama, Japan, 2012.

ISMM 2012 Best Poster Award
Winners: Yuzuru Iwasaki, Tsutomu Horiuchi, Michiko Seyama, Toru Miura, and Emi Tamechika, NTT Microsystem Integration Laboratories
Date: June 12, 2012
Organization: 2012 The 4th International Symposium on Microchemistry and Microsystems (ISMM)

For "Quick and Simple Measurement for Antibody Array in Disposable Microfluidic Device Using Surface Plasmon Resonance".

We have developed a disposable microfluidic device that is used in conjunction with a surface plasmon resonance (SPR) instrument to perform a quick, simple immunoassay. The key technologies we have developed are a data processing method for finding the locations of active antibodies, in-situ measurement of the flow velocity, and a disposable microfluidic device with an integrated capillary pumping system. They make it possible to detect antigens in milk every 10 minutes.

2012 TTC Distinguished Service Award
Winner: THironori Ohata, NTT Cyber Solutions Laboratories
Date: June 21, 2012
Organization: The Telecommunication Technology Committee (TTC)

For achievement of standardization activity concerning multimedia systems.

2012 TTC Distinguished Service Award
Winner: Yoshiyuki Mihara, NTT Cyber Solutions Laboratories
Date: June 21, 2012
Organization: The Telecommunication Technology Committee (TTC)

For achievement of standardization activity concerning home network topology identifying protocol.

Second Place in the Hans Gros New Investigator Award Poster Presentation Competition
Winners: Dan Mikami[1], Toshitaka Kimura[1], Kouji Kadota[2], Makio Kashino[1], and Kunio Kashino[1]
  [1] NTT Communication Science Laboratories
  [2] Osaka University
Date: July 6, 2012
Organization: 30th International Conference on Biomechanics in Sports

For "INTER-TRIAL DIFFERENCE ANALYSIS THROUGH APPEARANCE-BASED MOTION TRACKING".

The purpose of this study is to develop a method for quantitative evaluation and visualization of inter-trial differences in the motion of athletes. Previous methods for kinematic analysis of human movement have required attaching specific equipment to a body segment or can only be used in an environment designed for analyses. Therefore, they are difficult to use for observing motions in real games. To enhance the applicability to real-game situations, we propose appearance-based motion tracking. Our method only requires an image sequence from a camera. From the image sequence, automatic detection of trials and a difference analysis of them are conducted. We applied our method to the analysis of pitching motions in actual baseball games. Though we have no quantitative evaluations yet, the experimental results imply the efficacy of our method.

Published as: D. Mikami, T. Kimura, K. Kadota, M. Kashino, and K. Kasino, "INTER-TRIAL DIFFERENCE ANALYSIS THROUGH APPEARANCE-BASED MOTION TRACKING," Proc. of the 30 International Conference on Biomechanics in Sports, Melbourne, Australia, 2012.

Best Paper Award
Winners: Hiroyuki Shindo[1], Yusuke Miyao[2], Akinori Fujino[1], and Masaaki Nagata[1]
  [1] NTT Communication Science Laboratories
  [2] National Institute of Informatics
Date: July 10, 2012
Organization: The 50th Annual Meeting of the Association for Computational Linguistics

For "Bayesian Symbol-Refined Tree Substitution Grammars for Syntactic Parsing".

Published as: H. Shindo, Y. Miyao, A. Fujino, and M. Nagata, "Bayesian Symbol-Refined Tree Substitution Grammars for Syntactic Parsing," Proc. of the 50th Annual Meeting of the Association for Computational Linguistics, pp. 440–448, Jeju, Korea, 2012.

Papers Published in Technical Journals and Conference Proceedings

Explicit beat structure modeling for non-negative matrix factorization-based multipitch analysis

K. Ochiai, H. Kameoka, and S. Sagayama

Proc. of ICASSP 2012, Vol. 1, No. 1, pp. 133–136, Kyoto, Japan.

This paper proposes model-based non-negative matrix factorization (NMF) for estimating basis spectra and activations, detecting note onsets and offsets, and determining beat locations, simultaneously. Multipitch analysis is a process of detecting the pitch and onset of each note from a musical signal. Conventional NMF-based approaches often lead to unsatisfactory results very possibly because of the lack of musically meaningful constraints. As music is highly structured in terms of the temporal regularity underlying the onset occurrences of notes, we use this rhythmic structure to constrain NMF by parametrically modeling each note activation with a Gaussian mixture and derive an algorithm for iteratively updating model parameters. It is experimentally shown that the proposed model outperforms the standard NMF algorithms as regards onset detection rate.

Comparative evaluations of various harmonic/percussive sound separation algorithms based on anisotropic continuity of spectrogram

H. Tachibana, H. Kameoka, N. Ono, and S. Sagayama

Proc. of ICASSP 2012, Vol. 1, No. 1, pp. 465–468, Kyoto, Japan.

In this paper, we explore several algorithms to find the best performing algorithm for harmonic and percussive sound separation (HPSS) based on anisotropic continuity of a spectrogram through comparative evaluation of their experimental performance. Separating harmonic and percussive sounds is useful as a preprocessor for many music analysis purposes, including chord estimation and rhythm analysis, and other music information retrieval tasks. We have introduced a method called HPSS (Harmonic/Percussive Sound Separation) that decomposes a music signal into two components by separating the spectrogram into horizontally continuous and vertically continuous components, which roughly correspond to harmonic and percussive sounds, respectively. Though there are many possible ways to achieve the HPSS algorithm on the basis of this concept, it has not been known which algorithm performs best. This paper describes five different HPSS algorithms and compares their performances for real music signals.

Constrained and regularized variants of non-negative matrix factorization incorporating music-specific constraints

H. Kameoka, M. Nakano, K. Ochiai, Y. Imoto, K. Kashino, and S. Sagayama

Proc. of ICASSP 2012, Vol. 1, No. 1, pp. 5365–5368, Kyoto, Japan.

Music spectrograms typically have many structural regularities that can be exploited to help solve the problem of decomposing a given spectrogram into distinct musically meaningful components. In this paper, we introduce new variants of the non-negative matrix factorization concept that incorporate music-specific constraints.

RoF-DAS over WDM-PON using bandpass-sampling and optical TDM techniques as universal network for broadband wireless access

K. Tsukamoto, T. Iwakuni, K. Miyamoto, T. Higashino, S. Komaki, T. Tashiro, Y. Fukada, J. Kani, N. Yoshimoto, and K. Iwatsuki

Proc. of the 31st Progress In Electromagnetics Research Symposium, Vol. 1, No. 1, pp. 491–495, KL, Malaysia, 2012.

With the explosive growth of mobile communication traffic, the air interface of mobile services has rapidly improved, and new services are being provided in new radio frequency bands. Moreover, to effectively use frequency or network resources and avoid their bottlenecks, the use of femto-cell or pico-cell architectures has been started. Backhaul networks accommodating a huge number of these pico- and femto-cell stations have become a more important issue. Broadband fixed access networks such as fiber-to-the-home (FTTH) systems will play an important role as an entrance network for broadband wireless access. Radio-over-fiber (RoF) technologies can transparently transmit various types of radio services, and their use as entrance networks achieves an effective universal platform for newly arriving air interfaces. RoF-DAS (DAS: distributed antenna system) over a wavelength-division-multiplexing passive optical network (WDM-PON) using bandpass-sampling and optical time-division-multiplexing (TDM) techniques has been proposed as a universal entrance network for broadband wireless access. This paper introduces its proposed architecture and reports the latest results of experimental and theoretical investigation of the transmission performance.

Effect of source-motion and self-motion on the resetting of auditory scene analysis

H. Kondo, D. Pressnitzer, I. Toshima, and M. Kashino

Acoustics 2012, Journal of the Acoustical Society of America, Vol. 131, No. 4, p. 3268, Hong Kong, China.

Auditory scene analysis needs to parse the incoming flow of acoustic information into perceptual streams, such as distinct musical melodies or sentences from a single talker. Previous studies have demonstrated that the formation of auditory streams is not instantaneous: rather, streaming builds up over time and can be reset by sudden changes in the acoustics of the scene. The present study examined the effect of changes induced by voluntary head motion on streaming. A telepresence robot in a virtual-reality setup was used to disentangle all potential consequences of head motion: changes in acoustic cues at the ears, changes in apparent sound location, and changes in motor processes. The results showed that self-motion induced resetting of auditory streaming. An additive model analysis further revealed that resetting was largely influenced by acoustic cues and apparent sound location rather than by non-auditory factors related to head motion. Thus, low-level changes in sensory cues can affect perceptual organization, even though those changes are fully accounted for by self-motion of the listener. These results may reflect a widely distributed neural architecture for the formation of auditory streams.

One-by-one H_2 bubble counting during water electrolysis with a chemical electrometer

N. Clement, K. Nishiguchi, J. -F. Dufreche, D. Guerin, A. Fujiwara,

and D. Vuillaume

MRS Meeting, Materials Research Society, San Francisco, CA, USA, 2012.

We demonstrated the detection of hydrogen bubbles by using an ion-sensitive field-effect transistor (FET) based on a silicon transistor. Hydrogen bubbles are generated during electrolysis of an electrolyte and change the Nernst potential. Since the FET has high charge sensitivity, a small change in the Nernst potential caused by bubbles with a diameter of a few micrometers can be detected by the FET.

Layered boron nitride as a release layer for mechanical transfer of GaN-based devices

Y. Kobayashi, K. Kumakura, T. Akasaka, and T. Makimoto

Nature, Vol. 484, pp. 223–227, 2012.

Nitride semiconductors are the materials of choice for a variety of device applications, notably optoelectronics and high-frequency/high-power electronics. One important practical goal is to realize such devices on large, flexible, and affordable substrates, on which direct growth of nitride semiconductors of sufficient quality is problematic. Several techniques—such as laser lift-off—have been investigated to enable the transfer of nitride devices from one substrate to another, but existing methods still have some important disadvantages. Here we demonstrate that hexagonal boron nitride (h-BN) can form a release layer that enables the mechanical transfer of gallium nitride (GaN)-based device structures onto foreign substrates. The h-BN layer serves two purposes: it acts as a buffer layer for the growth of high-quality GaN-based semiconductors, and it provides a shear plane that makes it straightforward to release the resulting devices. We illustrate the potential versatility of this approach by using h-BN-buffered sapphire substrates to grow an AlGaN/GaN heterostructure with electron mobility of $1100\,cm^2\,V^{-1}\,s^{-1}$, an InGaN/GaN multiple-quantum-well structure, and a multiple-quantum-well light-emitting diode. These device structures, ranging in area from 5 mm × 5 mm to 2 cm × 2 cm, are then mechanically released from the sapphire substrates and successfully transferred onto other substrates.

First-principles study of nonclassical effects in silicon-based nanocapacitors

H. Kageshima and A. Fujiwara

Phys. Rev. B, Vol. 85, No. 20, 205304, 2012.

Properties of silicon-based nanocapacitors are studied from first principles. The nanocapacitor consists of electrodes of the silicon-based material planar polysilane. Nonclassical effects are analyzed by changing both the electrode spacing and the applied bias simultaneously. Even when the electrode spacing is fixed, the effective electrode spacing decreases with applied bias because of the quantum capacitance effect. In addition, when the electrostatic capacitance is analyzed in detail, it is also found that the effective electrode surface changes in a complicated manner with electrode spacing and applied bias because of the dielectric polarization effect of the electrode material. The dielectric polarization effect is one order of the magnitude smaller than the quantum capacitance effect, which is due to the nature of the electrode material, planar polysilane. It is clarified that a nanocapacitor is governed by the detailed properties of the electronic states of the electrode materials as well as the geometry.

Experimental Demonstration of Spatial Correlation Reduc-

tion Effect at MIMO Channel in RoF-DAS over WDM-PON System

T. Iwakuni, K. Miyamoto, T. Higashino, K. Tsukamoto, S. Komaki, T. Tashiro, Y. Fukada, J. Kani, N. Yoshimoto, and K. Iwatsuki

Proc. of APMP 2012, p. PA-14, Kyoto, Japan.

A radio-over-fiber distributed antenna system (RoF-DAS) over a wavelength-division-multiplexing passive optical network (WDM-PON) with multiple-input multiple-output (MIMO) has been proposed. The DAS has the effect of reducing the spatial correlation between MIMO channels. This paper describes an experimental demonstration of the spatial correlation reduction effect in an RoF-DAS system compared with a conventional concentrated antenna system.

A Proposal of Multi-Carrier Channel Control for Mobile Satellite Communication Systems to Make Maximum Use both of Transponder Bandwidth and Transmission Power

K. Nakahira, T. Sugiyama, H. Nishiyama, and N. Kato

IEICE Trans. on Communications (Japanese Edition), Vol. J95-B, No. 5, pp. 662–676, 2012.

This paper proposes a novel channel control technique for applying the propagation variation condition of mobile satellite earth stations. It is based on adaptive multi-carrier channel allocation (AMCA) that adjusts a modulation method carrier-by-carrier to flexibly utilize the satellite bandwidth and power simultaneously. Since the proposed technique controls transmission power and re-allocates AMCA channels in accordance with the earth station's propagation gain, it enables each of the channel resources needed for communication between stations to be maintained at a minimum level. Simulation evaluation shows that the proposed technique utilizes satellite resources more efficiently than a conventional method that fixes the transmission power for all earth stations. As a result, it enhances the system capacity by about 1.6 times.

Phase sensitive amplification with noise figure below the 3 dB quantum limit using CW pumped PPLN waveguide

M. Asobe, T. Umeki, and O. Tadanaga

Optics Express, Vol. 20, No. 12, pp. 13164–13172, 2012.

The noise figure (NF) of a phase sensitive amplifier (PSA) based on a continuous-wave (CW) periodically poled LiNbO3 (PPLN) waveguide was evaluated in the optical and electrical domains. Phase sensitive amplification was realized using degenerate parametric amplification in the PPLN waveguide, which was pumped by the second harmonic frequency of the signal. Second harmonic pumping enables direct observation of the intrinsic amplified spontaneous emission (ASE), which determined the NF of the PSA. An NF below the 3 dB quantum limit was obtained by observing the intrinsic ASE. The low NF was also confirmed via the noise floor measurement of a cascaded PSA and erbium doped fiber amplifier in the electrical domain. The PSA was used as a preamplifier for detecting a 40 Gbit/s phase shift keying signal. The low noise characteristics were confirmed by the improved sensitivity.

Extendable point-to-multi-point protocol processor for 10G-EPON MAC SoCs

N. Miura, A. Miyazaki, J. Kato, N. Tanaka, M. Urano, M. Nakanishi, and T. Shibata

Proc. of the 2012 IEEE International Symposium on Circuits and

Systems (ISCAS), Vol. 2012, No. 1, pp. 1464–1467, Seoul, Korea.

This paper presents a software-hardware co-operative protocol processor for media-access-control (MAC) system-on-a-chip (SoC) devices in a 10 Gigabit Ethernet passive optical network (10G-EPON), designed with a software-hardware division technique that focuses on the throughput and timing-accuracy requirements. This protocol processor consists of frame-processing hardware to meet the timing requirements, an interface to absorb the speed difference between software and hardware, and software to implement additional protocols. This protocol processor enables network operators to install additional service protocols adaptively for their own services. The 10G-EPON system with this protocol processor worked properly in the experiment.