External Awards

JSAI Incentive Award

Winner: Chihiro Yamamoto, NTT Cyber Solutions Laboratories
Date: June 10, 2010
Organization: The Japanese Society for Artificial Intelligence (JSAI)

For "A Method for Processing Text with Emoji".

This paper proposes a novel method for emoji disambiguation. Emoji are Japanese emoticons used in mobile phone email instead of words. They involve two ambiguities: role ambiguity and word sense ambiguity. We define four emoji roles: (1) word substitution, (2) addition of a word, (3) decoration, and (4) modality. Although word sense disambiguation can be solved using a conventional approach, role disambiguation is a unique characteristic of emoji. We focus on solving role ambiguity by using a learning algorithm. In order to handle pictograms, this paper also treats a method of generating a dictionary that maps pictograms to corresponding concepts.

Published as: C. Yamamoto, K. Bessho, T. Uchiyama, and T. Uchiyama, "A Method for Processing a Text with Emoji," SIG-KBS, JSAI, No. A904, Mar. 2010 (in Japanese).

Best Paper Award

Winner: Kazutaka Hara, Shunji Kimura, Hirotaka Nakamura, Naoto Yoshimoto, and Hisaya Hadama, NTT Access Network Service Systems Laboratories
Date: July 7, 2010
Organization: The 15th OptoElectronics and Communications Conference (OECC 2010)

For "Ultra Fast Response AC-coupled Burst-mode Receiver with High Sensitivity and Wide Dynamic Range for 10G-EPON Systems".

An ac-coupled burst-mode receiver for 10-Gbit/s-class PON systems has been developed by using a novel baseline-wander common-mode-rejection and inverted distortion technique. We achieved a settling time of less than 150 ns and a receiver sensitivity of -29.8 dBm at a bit error rate of 10^{-3}. This is the fastest value of any reported ac-coupled average-detection type burst-mode receiver for a 2^{31}-1 pseudo random bit sequence.

Published as: K. Hara, S. Kimura, H. Nakamura, N. Yoshimoto, and H. Hadama, "Ultra Fast Response AC-coupled Burst-mode Receiver with High Sensitivity and Wide Dynamic Range for 10G-EPON Systems," in Proc. OECC2010, 8A4-2, Sapporo, Japan.

2nd Communication Quality Best Paper Award

Winner: Ryoichi Kawahara[†1], Satoshi Kamei[†1], Noriaki Kamiyama[†1], Haruhisa Hasegawa[†1], Hideaki Yoshino[†1], Eng Keong Lua[†2], and Akihiro Nakao[†3]
†1 NTT Service Integration Laboratories
†2 Carnegie Mellon University
†3 The University of Tokyo
Date: July 8, 2010
Organization: Technical Committee on Communication Quality

For "A Method of Constructing QoS Overlay Network and Its Evaluation".

We propose a method of constructing a QoS overlay network that enables us to find a nearly optimal route in a cost-effective manner. Our idea is based on the finding that a small number of overlay nodes can provide the optimal routes for a large number of node pairs, which is obtained through measurement data analysis. Our overlay network has two layers where the upper layer consists of a small number of overlay nodes that can provide the optimal routes while the lower layer consists of the other overlay nodes. By allocating such overlay nodes at the upper layer, we can provide better QoS routes for each node pair with high probability. We construct an overlay network topology where the lower-layer overlay nodes are connected not in a full-mesh manner but only to upper-layer nodes. Through this structure, we can reduce measurement and route calculation costs.

Published as: R. Kawahara, S. Kamei, N. Kamiyama, H. Hasegawa, H. Yoshino, E. K. Lua, and A. Nakao, "A Method of Constructing QoS Overlay Network and Its Evaluation," IEICE Technical Report, Vol. 109, No. 274, CQ2009-41, pp. 15–20, Nov. 2009.

Best Paper Award

Winner: Kazutaka Hara, Shunji Kimura, Hirotaka Nakamura, Naoto Yoshimoto, and Hisaya Hadama, NTT Access Network Service Systems Laboratories
Date: July 13, 2010
Organization: The 9th International Conference on Optical Internet (COIN2010)

For "1.25/10.3-Gbit/s Dual-rate Burst-mode Receiver with Automatic Bit-rate Discrimination Circuit for Coexisting PON Systems".

A 1.25-/10.3-Gbit/s parallel-type dual-rate burst-mode receiver with a burst-mode bit-rate discrimination circuit for coexisting systems is demonstrated. The settling time including this discrimination is less than 250 ns for burst inputs with extremely different powers.

Published as: K. Hara, S. Kimura, H. Nakamura, N. Yoshimoto, and H. Hadama, "1.25/10.3-Gbit/s Dual-rate Burst-mode Receiver with Automatic Bit-rate Discrimination Circuit for Coexisting PON Systems," in Proc. COIN2010, TuC1-5, Jeju, Korea.

Papers Published in Technical Journals and Conferences Proceedings

Development of a Geolocation Finder Using QR Code

M. Higashida, Y. Matsushita, H. Hayashi, K. Miyake, M. Morikawa, N. Yoshitomi, and Y. Nawa

Journal of Social Safety Science, Institute of Social Safety Science, Vol. 1, No. 11, pp. 355–362, 2009 (in Japanese).

As a result of natural disasters such as earthquakes, municipalities have to deal with a large amount of paper documents such as damage reports. It takes considerable effort to input information written on the paper documents into computers to process the data in them within a limited time. In many cases, addresses are used as the location information, and electronic maps can make the data-processing operation more efficient. This paper proposes a method that automatically retrieves investigation results and location data by using QR codes related to the sets of investigation reports and affected area maps.

Perceptual Ambiguity of Bistable Visual Stimuli Causes No or Little Increase in Perceptual Latency

S. Takei and S. Nishida

Journal of Vision, The Association for Research in Vision and Ophthalmology, Inc. (ARVO), Vol. 10, No. 4, pp. 23:1–23:14, 2010.

Cognitive ambiguity, such as found in categorical judgments, increases behavioral response latency. We examined whether perceptual ambiguity for bistable stimuli, i.e., stimuli for which two perceptual interpretations are mutually competitive, also increased perceptual latency. We presented a bistable stimulus and measured the observer's reaction time to judge which of two possible percepts was seen. Perceptual ambiguity was systematically manipulated and its effect on the response latency was examined. The first experiment used a motion-defined rotating cylinder. The observers judged the rotation direction, and the perceptual ambiguity was controlled by means of binocular disparity. The second experiment used Rubin's vase. The observers judged whether the figure was a vase or face, and the perceptual ambiguity was controlled by means of the luminance of the surround. In both experiments, we found that the perceptual ambiguity caused only a small increase or no increase in reaction time and, presumably, in the perceptual latency included in the reaction time. These findings suggest that perceptual competition does not have a strong effect on the latency of the initial perception of bistable stimuli. Given that many perceptual problems are under-constrained, as in the cases of bistable stimuli, it is presumably ecologically functional for the brain to establish perception as quickly as possible regardless of the presence of potential alternatives.

Activation Energy of Healing of Low-energy Irradiation-induced Defects in Single-wall Carbon Nanotubes

S. Suzuki, K. Yamaya, Y. Homma, and Y. Kobayashi

Carbon, Elsevier, Vol. 48, No. 11, pp. 3211–3217, 2010.

We analyzed defects created by low-energy irradiation of single-wall carbon nanotubes (SWCNTs) by using Raman spectroscopy. The analysis was based on the recovery curves of the G/D ratio and there was no need to assume a specific functional form between the G/D ratio and the defect density. The obtained activation energies of defect healing were 0.7 or 1.4 eV, depending on the extent of the damage; these values are close to those for the recombination barriers of vacancy-adatom defects. Calculated recovery curves for the G/D ratio at room temperature show that the recovery is so slow that almost no recovery is observed on a usual time scale, which is consistent with experimental results.

Narrow Spectral Linewidth Operation (<160 kHz) in Widely Tunable Distributed Feedback Laser Array

H. Ishii, K. Kasaya, and H. Oohashi

Electron. Lett., Vol. 46, No. 10, pp. 714–715, 2010.

The spectral linewidth in a widely tunable distributed feedback laser array with a long cavity structure has been reduced. A narrow linewidth of less than 160 kHz was achieved over a 40-nm tuning range with a fibre output power of 20 mW.

RTD Oscillators at 430–460 GHz with High Output Power (~200 μW) Using Integrated Offset Slot Antennas

S. Suzuki, K. Hinata, M. Shiraishi, M. Asada, H. Sugiyama, and H. Yokoyama

Proc. 22nd IPRM (International Conference on Indium Phosphide and Related Materials), Vol. 22, pp. 152–155, Kagawa, Japan, May–June 2010.

We demonstrated the operation of GaInAs/AIAs resonant tunneling diode (RTD) oscillators with high output power (100–200 μW) at frequencies of 430–460 GHz using an offset-fed slot antenna, in which the RTD was placed 45 μm from the center of a 100-μm-long antenna. The highest output power obtained in this study was 200 μW at 443 GHz for a single RTD with a peak current density of 18 mA/μm^2. Output powers of 50–130 μW at frequencies of 460–490 GHz were also obtained in oscillators with different structures. Higher output is expected by optimizing the position and mesa area of the RTD and the antenna length.

High-electron-mobility $In_{0.53}Ga_{0.47}As/In_{0.8}Ga_{0.2}As$ Composite-channel Modulation-doped Structures Grown by Metal-organic Vapor-phase Epitaxy

H. Sugiyama, H. Matsuzaki, H. Yokohama, and T. Enoki

Proc. 22nd IPRM (International Conference on Indium Phosphide and Related Materials), Vol. 22, pp. 477–480, Kagawa, Japan, May–June 2010.

Metal-organic vapor-phase epitaxy (MOVPE) growth of In-rich $In_xGa_{1-x}As$ on InP was investigated as a way to obtain extremely high electron mobility in modulation-doped (MD) structures. High-quality $In_{0.53}Ga_{0.47}As/In_{0.8}Ga_{0.2}As$ composite-channel (CC) MD structures were successfully grown without significant lowering of the growth temperature. The room-temperature electron mobility in the CC MD reached 150,000 cm^2/Vs at a sheet carrier concentration (Ns) of $2.1x10^{12}$ cm^{-2}, which is one of the highest values ever reported in MOVPE-grown InP-based InGaAs/InAIAs MD structures.

Hash Property and Coding Theorems for Sparse Matrices and Maximum-likelihood Coding

J. Muramatsu and S. Miyake

IEEE Trans. on Information Theory, Vol. 56, No. 5, pp. 2143–2167, 2010.

The aim of this paper is to prove the achievability of rate regions for several coding problems by using sparse matrices (with logarithmic column degree) and maximum-likelihood (ML) coding. These problems are the Gel'fand-Pinsker problem, the Wyner-Ziv problem, and the one-helps-one problem (source coding with partial side information at the decoder). To this end, the notion of a hash property for an ensemble of functions is introduced and it is proved that an ensemble of q-ary sparse matrices satisfies the hash property. Based on this property, it is proved that the rate of codes using sparse matrices and ML coding can achieve the optimal rate.

Surface 210-nm Light Emission from an AlN p-n Junction Light-emitting Diode Enhanced by A-plane Growth Orientation

Y. Taniyasu and M. Kasu

Appl. Phys. Lett., Vol. 96, p. 221110, 2010.

A (1120) A-plane AlN p–n junction light-emitting diode (LED) with a wavelength of 210 nm is demonstrated. The electroluminescence from the A-plane LED is inherently polarized for the electric field parallel to the [0001] c-axis due to a negative crystal-field splitting energy. The polarization ratio (ratio of electric-field components parallel and perpendicular to the c-axis) is as high as 0.9. The radiation pattern of the A-plane LED shows higher emission intensity along the surface normal, while that of a conventional (0001) C-plane LED shows lower emission intensity along the surface normal. The different radiation patterns can be explained by the polarization properties.

A Study on Crisis Management for Swine Influenza (A/H1N1) in Kobe in 2009

M. Higashida and H. Hayashi

Institute of Social Safety Science, No. 26, pp. 99–102, 2010 (in Japanese).

An infected patient with new swine influenza (A/H1N1) as the first case in Japan was confirmed in Kobe City in May 2009. We arranged and analyzed the responses taken by the government of Kobe City. They were divided into six phases. This paper explains the social situation in each phase and the features of the response. The Kobe City government responded flexibly according to the situation of the site while referring to the response plan made beforehand. The purpose of this paper is to clarify why the responses of the Kobe City government to the first domestic case were good.

Universal Source Coding for Multiple Decoders with Side Information

S. Kuzuoka, A. Kimura, and T. Uyematsu

Proc. 2010 IEEE International Symposium on Information Theory (ISIT 2010), Vol. 1, No. 1, pp. 1–5, Austin, TX, USA, June 2010.

A multiterminal lossy source coding problem, which includes various problems such as the Wyner-Ziv problem and the complementary delivery problem as special cases, is considered. It is shown that any point in the achievable rate-distortion region can be attained even if the source statistics are not known.

Latent Variable Model for Describing the Relationship between Documents and Authors

N. Kawamae, H. Sakano, and T. Yamada

IEICE Trans. on Information and Systems, Vol. J93-D, No. 6, pp. 949–959, 2010 (in Japanese).

This paper presents a statistical model that captures not only the low-dimensional set of multinomial distributions over words, but also how this structure is composed of topics, document classes and author interests. Unlike other recent work that includes authors into the latent variable model, here the interest is represented as a latent variable having a probability distribution over topics and can be shared with authors who prefer a set of similar topics. Thus, this model represents each document as a mixture of topics, where the mixture proportion is sampled from this interest class. Experiments using a dataset of research papers shows that the proposed model can capture these interests, reduces the dimensionality of documents to a low-dimensional interest-topic space, and is useful as a generative model.

Topic Tracking Model for Purchase Behavior Analysis

T. Iwata, S. Watanabe, T. Yamada, and N. Ueda

IEICE Trans. on Information and Systems, Vol. J93-D, No. 6, pp. 978–987, 2010 (in Japanese).

We propose a topic model for tracking time-varying consumer purchase behavior in which consumer interests and item trends change over time. The proposed model can adaptively track changes in interests and trends based on current purchase logs and previously estimated interests and trends. Its online nature means we do not need to store past data for current inferences, so we can considerably reduce the computational cost and the memory requirement. We use real purchase logs to demonstrate the effectiveness of the proposed method in terms of the prediction accuracy of purchase behavior and the computational cost of an inference.

A Study of Problems Related to the Secrecy of Communication about Whether the Telecommunications Carrier Providing a Communication Service Using a Honey Pot Is a Party to the Communication

F. Magata and K. Takahashi

Information Network Law Review, Vol. 9, No. 1, p. 102, 2010 (in Japanese).

The honey pot has long been known as a safe means of examining cyber attacks over the Internet. Many telecommunications carriers already make use of honey pots. The relation between the secrecy of communication and the fact that telecommunications carriers use communications records acquired in the honey pot on the Internet for themselves has still not been discussed enough. The mode of legal protection for communication records differs greatly according to whether or not the record keeper is a party to the communication and whether or not the telecommunication equipment is used to communicate with others. First, the difference in protection provided by the law on communications records acquired in the honey pot is clarified by dividing the secrecy of communication into third-party communication and the secrecy of communication in a communication service. Next, telecommunication line equipment with a honey-pot function is assumed; the secrecy of communication is examined focusing on the possibility that the telecommunications carrier is a party to the communication. This study is a step toward a partial

solution of an unsolved problem that has already been pointed out. The unsolved problem is that because telecommunications carriers try to avoid infringing the secrecy of communication, the proper accomplishment of the infringement for the purposes of public interest is disturbed.

Depth Reproducibility of Multiview Depth-fused 3-D Display

M. Date, Y. Andoh, H. Takada, Y. Ohtani, and N. Matsuura

Journal of the Society for Information Display, Vol. 18, No. 7, pp. 461–534, 2010.

A multiview depth-fused 3-D (DFD) display that provides smooth motion parallax for wide viewing angles is proposed. A conventional DFD display consists of a stack of two transparent emitting screens. It can produce motion parallax for small changes in observation angle, but its viewing zone is rather narrow due to the split images it provides in inclined views. On the other hand, even though multiview 3-D displays have a wide viewing angle, motion parallax in them is discrete, depending on the number of views they show. By applying a stacked structure to multi-view 3-D displays, we fabricated a wide-viewing-angle 3-D display with smooth motion parallax. Experimental results confirmed the viewing-zone connection of DFD displays while the calculated results show the feasibility of stacked multiview displays.

Nucleus and Spiral Growth Mechanisms of GaN Studied by Using Selective-area Metalorganic Vapor Phase Epitaxy

T. Akasaka, Y. Kobayashi, and M. Kasu

Appl. Phys. Express, Vol. 3, No. 7, p. 075602, 2010.

We used selective-area metalorganic vapor phase epitaxy to study Frank-van der Merwe growth mechanisms of GaN. Step-free GaN surfaces with the diameter of 15–50 μm were fabricated within selective areas free of screw-type dislocations. The growth rate was independent of the area, indicating multi-nucleation growth. The nucleation rate was in the range of 10^5–10^7 cm^{-2} s^{-1} and the average two-dimensional nucleus density was 5×10^6 cm^{-2}. Selective areas having screw-type dislocations resulted in double growth spirals consisting of monolayer steps. The degree of supersaturation near the growing surface calculated from the interstep distance was independent of the area.

Non-catalytic Growth of Graphene-like Thin Film Near Pattern Edges Fabricated on SiO_2 Substrates

S. Suzuki, Y. Kobayashi, T. Mizuno, and H. Maki

Thin Solid Films, Vol. 518, No. 18, pp. 5040–5043, 2010.

Graphene-like thin films were grown on patterned SiO_2 substrates by simple thermal chemical vapor deposition using ethanol. The film growth occurred preferentially in the vicinity of pattern edges. Catalytic metal was not necessary for the substrate or the pattern. The films consisted of graphitic nanocrystals with sizes of several nanometers. Among the electric properties, a field effect was observed at room temperature.
