## Papers Published in Technical Journals and Conference Proceedings

#### Definition, Implementation and Evaluation of Generic Search Function for Current Sensor Status in Database for Sensor Networks

T. Nakamura, Y. Higashijima, M. Nakamura, and M. Matsuo

IEICE Trans. on Information and Systems, Vol. J96-D, No. 5, pp. 1132–1144, 2013 (in Japanese).

We propose a search function for the current sensor status provided by a database management system (DBMS) for sensor networks. Previous studies have investigated two practically important search functions in DBMSs specially designed for sensor networks: accumulated data history search and continuous search (immediate data delivery). We determined the necessity of and the problems with a third search function that returns a list of current sensor statuses by implementation of sensor network application systems. We also developed a formal definition of this search function. This definition clarifies the semantics of a search and can be used as a guide in designing the input/output parameters in a new generic search API for a DBMS. We implemented the proposed search function and applied it to the development of several application systems used in field trials.

### Improving Nonlinear Degradation by Combining Optical and Digital Compensation Techniques

K. Shibahara, Y. Sakamaki, T. Kawai, K. Mori, H. Kishikawa, and M. Fukutoku

Proc. of the 18th OptoElectronics and Communications Conference held jointly with 2013 International Conference on Photonics in Switching (OECC/PS 2013), Vol. OECC, No. 2013, pp. WR4–6, Kyoto, Japan.

We investigate the combined effect of optical and digital compensation techniques for nonlinear degradation by numerical simulation. Q-factor improvement by digital compensation increases when nonlinearity is optically suppressed in a dispersion-managed system.

# 409-Tb/s + 409-Tb/s Crosstalk Suppressed Bidirectional MCF Transmission over 450 km Using Propagation-direction Interleaving

A. Sano, H. Takara, T. Kobayashi, H. Kawakami, H. Kishikawa, T. Nakagawa, Y. Miyamoto, Y. Abe, H. Ono, K. Shikama, M. Nagatani, T. Mori, Y. Sasaki, I. Ishida, K. Takenaga, S. Matsuo, K. Saitoh, M. Koshiba, M. Yamada, H. Masuda, and T. Morioka

Opt. Express, OSA, Vol. 21, No. 14, pp. 16777-16783, 2013.

We demonstrate bidirectional transmission over 450 km of newly developed dual-ring structured 12-core fiber with a large effective area and low crosstalk. Inter-core crosstalk is suppressed by employing propagation-direction interleaving, and 409-Tb/s capacities are achieved for both directions.

#### Dynamic Optical Transport Connection with a 100 Gbit/s Digital Coherent Optical Transponder for Disaster-resilient Networking

T. Hirooka, M. Nakazawa, H. Kubota, T. Komukai, and T. Sakano

Proc. of the IEEE Region 10, Humanitarian AdHoc Committee, Vol. 1, No. 1, p. TS10, Sendai, Miyagi, Japan, 2013.

We demonstrate dynamic optical transport connectivity to various lengths and types of fiber (SMF, DSF, GI-62.5/125 fiber) with a 100-Gbit/s digital coherent optical transponder. The outage time associated with connection was only about 70 ms (potentially as fast as 20 ms) in all configurations. This feature provides great simplicity and flexibility as regards immediate broadband connection to the backbone networks in case of a devastating disaster.

#### Impact of Transponder Architecture on the Scalability of Optical Nodes in Elastic Optical Networks

T. Tanaka, A. Hirano, and M. Jinno

IEEE Communications Letters, Vol. 17, No. 9, pp. 1846–1848, 2013.

The elastic optical network has proven to be a promising network architecture for handling the rapid growth in IP traffic in the optical layer in a spectrum-efficient manner. This study reveals the optical node requirements in elastic optical networks by comparing multiple network architectures using an integrated resource allocation scheme that considers both network and node parameters. Evaluations show that the multiflow transponder-based elastic optical network architecture is superior to two other architectures in terms of scalability of optical nodes and network costs.

### Silica-based 100-GHz-spacing Integrated 40- $\lambda$ 1x4 Wave-length Selective Switch

T. Yoshida, H. Asakura, T. Mizuno, H. Takahashi, and H. Tsuda Proc. of the 39th European Conference and Exhibition on Optical Communication (ECOC 2013), Vol. We.4.B.3, No. 1, pp. 1–3, London, UK.

A densely integrated  $1 \times 4$  wavelength selective switch was designed and fabricated. The channel spacing is 100 GHz and the number of channels is 40. The transmission losses and the crosstalk are less than 8.8 dB and -19.4 dB, respectively.

#### Impact of Multi-flow Transponder on Equipment Requirements in IP over Elastic Optical Networks

T. Tanaka, A. Hirano, and M. Jinno

Proc. of the 39th European Conference and Exhibition on Optical Communication (ECOC 2013), Vol. We.1.E.3, No. 1, pp. 1–3, London, UK.

We evaluate the elastic optical network performance from the network to node equipment level using a multi-layer network design scheme. Results show that the multi-flow transponder-based network model reduces equipment requirements such as router IFs and transponders compared to mixed-line-rate and bandwidth-variable models.

#### Noise Model Transfer: Novel Approach to Robustness Against Nonstationary Noise

T. Yoshioka and T. Nakatani

IEEE Trans. on Audio, Speech, and Language Processing, Vol. 21, No. 10, pp. 2182–2192, 2013.

This paper proposes an approach called a noise model transfer (NMT), for estimating the rapidly changing parameter values of a feature-domain noise model, which can be used to enhance feature vectors corrupted by highly nonstationary noise. Unlike conventional methods, the proposed approach can exploit both observed feature vectors, representing spectral envelopes and other signal properties that are usually discarded during feature extraction but that are useful for separating nonstationary noise from speech. Specifically, we assume the availability of a noise power spectrum estimator that can capture rapid changes in noise characteristics by leveraging such signal properties. NMT determines the optimal transformation from the estimated noise power spectra into the feature-domain noise model parameter values in the sense of maximum likelihood. NMT is successfully applied to meeting speech recognition, where the main noise sources are competing talkers; and reverberant speech recognition, where the late reverberation is regarded as highly nonstationary additive noise.

#### Usefulness of Acoustical Telepresence Robot for Auditory Psychophysics

T. Iwaki, S. Aoki, H. M. Kondo, M. Kashino, and T. Hirahara Journal of the Robotics Society of Japan, Vol. 31, No. 8, pp. 788– 796, 2013 (in Japanese).

We devised an acoustical telepresence robot, "TeleHead", that has a user-like dummy head and can be synchronized with the user's head movement. We performed several psychophysical experiments to assess sound localization, delay discrimination, and auditory perceptual grouping ability in humans. The errors of the sound localization via TeleHead were less than 10 deg. Head posture changes during the discriminable delay time ranged from 10 deg to 17 deg. The performance of auditory perceptual grouping did not differ between conditions with and without TeleHead. In addition, we used TeleHead to divide head movement effects on perception into three factors: selfmovement, sound source movement, and acoustical change. The results indicate that TeleHead can mirror the 3D motion of users with minimal latency and distortion, suggesting that it is a useful tool for measurements of human auditory perception.

#### Image Context Discovery from Socially Curated Contents

A. Kimura, K. Ishiguro, M. Yamada, A. M. Alvarez, K. Kataoka, and K. Murasaki

Proc. of the 21st ACM International Conference on Multimedia (MM'13), Vol. 1, No. 1, pp. 565–568, Barcelona, Spain, 2013.

This paper proposes a novel method of discovering a set of image contents sharing a specific context (attributes or implicit meaning) with the help of image collections obtained from social curation platforms. Socially curated contents are promising for analyzing various kinds of multimedia information, since they are manually filtered and organized based on specific individual preferences, interests or perspectives. Our proposed method fully exploits the process of social curation: (1) How image contents are manually grouped together by users, and (2) how image contents are distributed in the platform. Our method reveals the fact that image contents with a specific context are naturally grouped together and every image content item includes various contexts that cannot necessarily be verbalized by texts.

#### **Heat Blueprint**

#### T. Natsume

The OpenStack Summit Hong Kong 2013

We suggest adding a retry function and the resource type of NVP network gateway for "Heat", which realizes orchestration in Open-Stack.

#### **Clustering-based Anomaly Detection in Multi-view Data**

A. M. Alvarez, M. Yamada, A. Kimura, and T. Iwata

Proc. of the 21st International Conference on Information and Knowledge Management (CIKM 2013), Vol. 1, No. 1, pp. 1545–1548, Burlingame, CA, USA.

This paper proposes a simple yet effective anomaly detection method for multi-view data. The proposed approach detects anomalies by comparing the neighborhoods in different views. Specifically, clustering is performed separately in the different views and affinity vectors are derived for each object from the clustering results. Then, the anomalies are detected by comparing affinity vectors in the multiple views. An advantage of the proposed method over existing methods is that the tuning parameters can be determined effectively from the given data. Through experiments on synthetic and benchmark datasets, we show that the proposed method outperforms existing methods.

### Exploiting Socially Generated Side Information in Dimensionality Reduction

A. M. Alvarez, M. Yamada, and A. Kimura

Proc. of the 2nd International Workshop on Socially-aware Multimedia, Barcelona, Spain, 2013.

In this paper, we show how side information extracted from socially curated data can be used within a dimensionality reduction method and to what extent this side information is beneficial to several tasks such as image classification, data visualization and image retrieval. The key idea is to incorporate side information of an image into a dimensionality reduction method. More specifically, we propose a dimensionality reduction method that can find an embedding transformation so that images with similar side information are close in the embedding space. We introduce three types of side information derived from user behavior. Through experiments on images from Pinterest, we show that incorporating socially generated side information in a dimensionality reduction method benefits several imagerelated tasks such as image classification, data visualization and image retrieval.

#### High-charge-sensitivity Radio-frequency Field-effect Transistor with Large and Tunable Readout Frequency

K. Nishiguchi, H. Yamaguchi, A. Fujiwara, H. S. J. van der Zant, and G. A. Steele

Proc. of the 26th International Microprocesses and Nanotechnology Conference (MNC 2013), 7B-4-1, Sapporo, Hokkaido, Japan.

We introduce the RF-FET composed of double LC matching circuits. The double matching circuits provide an additional resonance condition tuned by a variable capacitor, which allows the extension of the readout frequency to 200 MHz.

#### Dual-gate Silicon Single-electron Transistor Threshold Voltage Mapping at Nanoscale with a Scanning Microwave Microscope

N. Clément, F. Wang, K. Nishiguchi, A. Fujiwara, G. Patriarche, D. Troadec, B. Legrand, G. Dambrine, and D. Théron

Proc. of the 26th International Microprocesses and Nanotechnology Conference (MNC 2013), 7B-4-2, Sapporo, Hokkaido, Japan.

Using a scanning microwave microscope (SMM) with F sensitivity, we demonstrate spatial mapping of the threshold voltage of a silicon single-electron transistor whose conductivity is fully controlled by dual gates composed of a back gate and an SMM cantilever. The SMM is a reliable alternative tool for electrical characterization of emerging nanoscale devices.

### Ultimate Integration of a PDMS-based Lab-on-a-Chip with Nanotransistor Biosensors

R. Sivakumarasamy, K. Nishiguchi, A. Fujiwara, D. Vuillaume, and N. Clément

Proc. of the 26th International Microprocesses and Nanotechnology Conference (MNC 2013), 8C-8-3, Sapporo, Hokkaido, Japan.

We address the question of the maximum integration possible for such PDMS-based lab-on-chips (LOCs) and show that there is a critical distance (typically a few tens of micrometers) between the channel and electrical contacts, below which we observed leakage.