External Awards

Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (Prize for Creativity)
Winner: Kazunari Ushiki, NTT Service Integration Laboratories
Date: April 12, 2010
Organization: The Ministry of Education, Culture, Sports, Science and Technology

For contributions to the improvement of in-service quality management for IPTV services.

Papers Published in Technical Journals and Conferences

EJB-based Implementation of L1VPN NMS Controlled by Each Customer

H. Matsuura and N. Morita

Proc. The 11th IFIP/IEEE International Symposium on Integrated Network Management, NY, USA, 2009.

We propose a new service for the L1VPN (layer-1 virtual private network), in which an L1VPN customer can manage and control its own L1VPN from an end-to-end point of view. These operations are conducted by an L1VPN NMS (network management system), which is distributed online by an L1VPN provider in EJB (Enterprise Javabeans) format. In addition to the L1VPN NMS, EJB-based customer domain NMSs that manage individual customer domains are also delivered to individual customers. In cooperation with the provider NMS, which is for the L1VPN provider network, and the customer domain NMSs, an L1VPN NMS can update the L1VPN logical information from provider and customer domains.

Quantum Addition Circuits and Unbounded Fan-out

Y. Takahashi, S. Tani, and N. Kunihiro

Proc. The 9th Asian Conference on Quantum Information Science, Nanjing University, Vol. 1, No. 1, pp. 45–46, Nanjing, China, 2009.

We study the problem of constructing quantum addition circuits with better complexity. The problem is important not only for implementing Shor's algorithms on a quantum computer but also for understanding the computational power of small quantum circuits. First, we construct a quantum addition circuit with no ancillary qubits, which is more efficient and implementable than previous ones with no ancillary qubits. Then, we propose a method using the circuit that yields various types of efficient quantum addition circuits.

Flexible Chromatic Dispersion Compensation over Entire *L*-Band for over 40-Gb/s WDM Transparent Networks Using Multichannel Tunable Optical Dispersion Compensator

S. Sohma, K. Mori, H. Masuda, A. Takada, K. Seno, K. Suzuki, and N. Ooba

IEEE Photon. Technol. Lett., Vol. 21, No. 17, pp. 1271–1273, 2009.

We describe a proof-of-concept demonstration of flexible chromatic dispersion compensation over the entire *L*-band region for wavelength-division-multiplexing transparent networks operating at over 40 Gb/s using span-by-span compensation with an arrayed-waveguide grating and a liquid-crystal-on-silicon-based multichannel tunable dispersion compensator.

Video Monitoring of Slope Failure Using Spatiotemporal Gabor Filtering

K. Okamoto, T. Watanabe, H. Ban, Y. Maeda, A. Hanazawa, and T. Morie

Proc. The 2009 IEEE International Conference on Systems, Man, and Cybernetics, pp. 986–991, San Antonio, TX, USA, 2009.

We propose a method for detecting precursors, such as a small rock and/or soil fall, which occur prior to massive slope failure. The key feature of our method is directly recognizing the trajectory of a small collapse using spatiotemporal Gabor filtering. Simulation analysis, where the conditions of the simulation are quantitatively defined, reveals the effectiveness of the proposed method in detecting a tiny moving object with low contrast in the background under low frame-rate video monitoring. Experiments using actual monitoring videos of a hazardous slope confirmed the effectiveness of our method. The effects of error factors in an outdoor environment, which may inhibit recognition, are also evaluated.

Multi-sized Sphere Packing

S. Yamada, J. Kanno, and M. Miyauchi

Proc. The 7th Japan Conference on Computational Geometry and Graphs, Vol. 5A, No. 4, pp. 1–4, Kanazawa, Japan, 2009.

It is known that dried concrete contains numerous pores which allow for concrete deterioration by providing chloride ions a path to the supporting rebar. A new method called electrokinetic packing using nanoparticles to fill the pores was proposed and at least two different sizes of nanoparticles must be used. We found a simple approximate relation for the two sphere sizes that provides a high density in the problem of packing multi-sized random spheres into a container by using only parameter $\beta = B/V$, where B is the container's surface area and V is its volume.

Development and Standardization Activities on OTN for 40G/100G Ethernet Transport

M. Tomizawa and S. Aisawa

IEICE Tech. Report, IA2009-87, Technical Committee on Internet Architecture, Tokyo, Japan, 2010 (in Japanese).

Standardization discussion is active in ITU-T Study Group 15 regarding extension of the Optical Transport Network (OTN) from the ordinary SDH/SONET-oriented scheme to a more Ethernet-optimized one for wide-area transport of high-speed Ethernet client signals such as 40GE and 100GE, for which the local area network (LAN) standard will be approved in June 2010. In this paper, standardization activities of ITU-T SG15 regarding the extension of OTN are introduced, in conjunction with IEEE802.3 regarding 40G/100G Ethernet. Also our activities on the development of LAN/WAN conversion technology are described, which contributed to the standardization (WAN: wide area network).

A Scalable Multi-layer Hypercube Photonic Network Architecture

T. Sakano, A. Kadohara, Y. Sone, A. Watanabe, and M. Jinno

IEICE Tech. Report, PN2009-96, Technical Committee on Photonic Network, Okinawa, Japan, 2010 (in Japanese).

With the popularization of cloud computing services, the required scales of datacenter and intra-datacenter networks have considerably increased recently. This paper proposes a photonic network architecture which fulfills the requirement for an intra-datacenter network. The proposed architecture forms a multi-layer hypercube network with arrayed waveguide grating devices and a combination of several multiplexing systems such as TDM (time division multiplexing), WDM (wavelength division multiplexing), WBDM (wave-band division multiplexing), and SDM (space division multiplexing). Estimation shows that the proposed architecture enables us to achieve a petabit-class, large-scale hypercube network with existing technologies.

Use of Morphosyntactic Cues in Verb Learning by Japanese 16-month-old Children

T. Kobayashi and Y. Oshima-Takane

Proc. The 23rd Annual CUNY Conference on Human Sentence Processing, p. 176, New York, USA, 2010.

The present findings demonstrate that by 16 months of age, Japanese-learning children can rapidly map novel words to actions rather than agents when they hear the novel word embedded in an intransitive verb sentence frame with a null subject. This is the first evidence showing that even in immature word learners before the onset of vocabulary spurt, their morphosyntactic representations are abstract enough to guide early verb learning.

Simple Sets of Measurements for Universal Quantum Computation and Graph State Preparation

Y. Takahashi

arXiv: 1003.1545v1, Cornell University Library, Vol. 1, No. 1, pp. 1–10, 2010.

We consider the problem of minimizing resources required for universal quantum computation using only projective measurements. The resources we focus on are observables, which describe projective measurements, and ancillary qubits. We give a universal set of observables that is simpler than a previous one in the sense that one-qubit projective measurements described by the observables in the set are ones only in the (X,Y) plane of the Bloch sphere. The proof of the universality immediately implies a simple set of observables that is approximately universal for quantum computation. Moreover, the proof implies a simple set of observables for preparing graph states efficiently.

Speech Recognition Thresholds of Monosyllables with Noise: an Analysis of Spoken Syllables in FW03

K. Kondo, S. Sakamoto, N. Amamo, and Y. Suzuki

Acoustical Society of Japan, Vol. 66, No. 3, pp. 105–111, 2010 (in Japanese).

A syllable intelligibility test under noisy condition was conducted using spoken monosyllables in the Familiarity-controlled Word Lists (FW03) [NII Speech Resources Consortium, 2006]. The result showed that the syllable intelligibilities differed even though the syllables were presented under the same signal-to-noise ratio condition which was measured in terms of equivalent continuous A-weighted sound pressure level (LAeq). Speech recognition thresholds (SRTs) for 100 syllables spoken by four speakers in FW03 were estimated by fitting the cumulative normal distribution function to the syllable intelligibility data. The estimated SRTs are shown in a table as a reference for differences of intelligibility among syllables.

Non-negative Temporal Decomposition of Speech Parameters

S. Hiroya

Proc. ICASSP 2010, IEEE, pp. 5066–5069, Dallas, USA, 2010.

We present a non-negative temporal decomposition method for line spectrum pair and articulatory parameters. Based on the multiplicative update rules derived from a non-negative matrix factorization algorithm, these parameters decompose into a set of temporally overlapped event functions that are restricted to the range [0, 1] and corresponding event vectors. With the proposed method, the RMS error of the measured and estimated articulatory parameters is 0.16 mm and the spectral distance of the measured and estimated line spectrum pair parameters is 1.97 dB. These results also show that these estimation errors of the proposed method are significantly smaller than those of the conventional method. This technique will be useful for many applications, such as speech coding and speech modification.
