# Papers Published in Technical Journals and Conferences

## A Study of MPEG-2 to H. 264 Intra Transcoding for Progressive Contents

T. Yoshitome, J. Naganuma, and Y. Yashima

An MPEG-2 to H. 264 intra transcoding method for progressive contents has been developed. This method uses the encoding information from the MPEG-2 stream and keeps as many discrete cosine transform coefficients of the original MPEG-2 bitstream as possible. Experimental results show that the proposed method improved the peak signal-to-noise ratio by about 0.53–1.80 dB compared with the conventional method.

## Single-electron counting statistics and its circuit application in nanoscale field-effect transistors at room temperature

K. Nishiguchi and A. Fujiwara

A circuit utilizing single electrons is demonstrated at room temperature. Individual electrons randomly passing through the nanoscale silicon-on-insulator metal-oxide-semiconductor field-effect transistor (MOSFET) are monitored by an electrometer in real time. Such a random behavior of single electrons is used for high-quality random-number generation suitable for data processing which stochastically extracts the most preferable pattern among various ones. MOSFET-based random-number generation allows fast operation as well as high controllability, which leads to flexible extraction of the preferable pattern.

## Deducing a User's State of Mind from Analysis of the Pictographic Characters and Emoticons used in Mobile Phone Emails for Personal Content Delivery Services

K. Takami, R. Yamashita, K. Tani, Y. Honma, and S. Goto

As the ubiquitous environment is taking root, there are calls for services that deliver content appropriate for the individual user's personal interests and preferences. However, it is difficult to deduce the ever-changing preferences of people who live in a complicated society. In this paper, we focus on mobile phones, whose users are growing in number and which offer many sophisticated functions besides the ability to talk. We propose a method of deducing the state of mind of the user by analyzing the pictographic characters and emoticons used in his or her emails. Moreover, we have proposed a method of selecting an appropriate piece of music based on a music type, which is represented by the "number of chords", "sound strength", and "melody pattern" in a piece of music. We have developed the algorithm to deduce the user's state of mind from an email and applied it to the selection of music judged to be closely related to people's feelings.

## Hodgkin-Huxley Model-based Analysis of Electric-field Effect on Nerve Cell Using Self-organizing Map

M. Masugi and K. Murakawa

This paper describes an analysis of the effects of electric field on nerve cells by using the Hodgkin-Huxley model. When evaluating our model, which combines an additional ionic current source and generated membrane potential, we derive the peak-to-peak value, the accumulated square of variation, and Kolmogorov-Sinai (KS) entropy of the cell-membrane potential excited by 10-Hz, 100-Hz, 1-kHz, and 10-kHz-sinusoidal electric fields. In addition, to obtain a comprehensive view of the time-variation patterns of our model, we used a self-organizing map, which provides a way to map high-dimensional data onto a low-dimensional domain. Simulation results confirmed that lower-frequency electric fields tended to increase fluctuations of the cell-membrane potential, and the additional ionic current source was a more dominant factor for fluctuations of the cell-membrane potential. On the basis of our model, we visually confirmed that the obtained data could be projected onto the map in accordance with responses of cell-membrane potential excited by electric fields, resulting in a combined depiction of the effects of KS entropy and other parameters.

## Congestion Control in TCP/AQM Networks Using a Disturbance Observer

R. Kubo, J. Kani, and Y. Fujimoto

This paper presents a novel congestion controller for transmission control protocol/active queue management (TCP/AQM) networks. In order to maintain the queue length at a value less than the buffer size at the aggregation nodes, the queue management mechanism drops some packets depending on the probability calculated by a congestion controller. However, conventional controllers such as random early detection (RED) algorithms and proportional-integral-derivative (PID)-based controllers are not compatible with parameter variation in TCP/AQM networks. Parameter variation in TCP/AQM networks, which includes the change of the number of TCP connections and the inflow of user datagram protocol (UDP) flows. In the proposed method, the effect of parameter variation is estimated as drop probability disturbance by using a disturbance observer (DOB). By using the DOB, disturbance suppression characteristics of the controlled system can be drastically improved. In addition, the TCP/AQM network system is analyzed on the basis of an acceleration control scheme. The proposed method is validated by simulation studies performed using a nonlinear model of a TCP/AQM network and verifications made using the network simulator ns-2.

## Proposal and Performance Analysis of a Power-saving Mechanism for 10-Gigabit-class Passive Optical Network Systems

R. Kubo, J. Kani, Y. Fujimoto, N. Yoshimoto, and K. Kumozaki

Reducing the power consumed by network systems has become a major issue in recent years. This paper proposes a sleep and periodic wake-up (SPW) regime for optical network units (ONUs) to reduce the power consumed by passive optical network (PON) systems. In addition, the protocols needed between an optical line terminal (OLT) and ONUs are described using two 10-Gigabit-class PON systems as examples: we propose protocols to allow variable sleep time, by

which the power-saving efficiency can be further optimized. Moreover, a method of setting the control parameters such as sleep mode trigger and sleep time is discussed in detail based on simulation results.

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### A 10-Gb/s Burst-mode Limiting Amplifier Using a Two-stage Active Feedback Circuit

M. Nogawa, K. Nishimura, J. Terada, M. Nakamura, S. Nishihara, and Y. Ohtomo

Symposium on VLSI Circuits, JSAP and IEEE, Vol. 2009, pp. 18–19, Kyoto, Japan, 2009.

A 10.3125-Gb/s burst-mode limiting amplifier (LIA) for 10G-EPON systems has been developed. The LIA is composed of two-stage amplifiers with active feedback that provides automatic voltage offset cancellation (AOC) in 200 ns for both 20- and 200-mV$_{pp}$ input. The AOC time of 200 ns is 75% faster than the maximum settling time of 800 ns in 10G-EPON specifications. The LIA with a receiver optical subassembly has a sensitivity of –29 dBm and a dynamic range of 23 dB at BER of $10^{-3}$.

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### An MPEG-2 to H.264 Transcoding Method Preserving DCT Information for Progressive Contents

T. Yoshitome, J. Naganuma, and Y. Yashima

The Institute of Image Information and Television Engineers, Vol. 63, No. 6, pp. 837–846, 2009.

An MPEG-2 to H. 264 transcoding method preserving discrete cosine transform (DCT) information is proposed. This method uses the encoding information from an MPEG-2 stream and keeps the DCT coefficients of the original MPEG-2 bitstream as much as possible. Experimental results show that the proposed method increased the peak signal-to-noise ratio by about 0.20–1.11 dB compared with the conventional method.

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### On real factors of real interval polynomials

H. Sekigawa

Journal of Symbolic Computation, Elsevier, Vol. 44, No. 7, pp. 908–922, 2009.

For a real multivariate interval polynomial $\mathcal{P}$ and a real multivariate polynomial $f$, we provide a rigorous method for deciding whether there is a polynomial $p$ in $\mathcal{P}$ such that $f$ is a factor of $p$. When $\mathcal{P}$ is univariate, there is a well-known criterion for whether there exists a polynomial $p$ in $\mathcal{P}$ such that $p(a) = 0$ for a given real number $a$. Since $p(a) = 0$ if and only if $x - a$ is a factor of $p$, our result is a generalization of the criterion to multivariate polynomials and higher-degree factors. Furthermore, for real multivariate polynomials $p$ and $f$, we show a method for computing the nearest polynomial $q$ to $p$ in a weighted $l^{\infty}$-norm such that $f$ is a factor of $q$.

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