

External Awards

IEEE International Conference on Broadband Network & Multimedia Technology (IEEE IC-BNMT 2010) Best Paper Award

Winner: Daisuke Ikegami and Toshiaki Tsuchiya, NTT Service Integration Laboratories

Date: Oct. 28, 2010

Organization: IEEE

For “Evaluating TCP Throughput and Packet Size Under Policing Environment”.

Papers Published in Technical Journals and Conference Proceedings

Numerical Analysis of Singularity Exponent for Sharp Corners

T. Shibata

Proc. of the Microwave Conference 2009, APMC 2009, Asia Pacific, pp. 838–841, Singapore, Dec. 2009.

The singularity behavior of an electromagnetic field near sharp edges and corners has been a crucial topic in microwave field theory and analyses. The magnitude of field components in the neighborhood of a sharp corner may increase rapidly as the point approaches the tip, which can be expressed in terms of $\rho^{**}(\tau-1)$, where ρ represents the distance from the tip of the corner and τ is a characteristic value of the exponent, which depends on materials and the local structure of the corner. Having the τ values for various corners as preliminary knowledge, we can devise more accurate and more efficient analyses of microwave problems. This paper presents an improved numerical analysis method for τ of complex corners based on finite-difference simulation.

High-speed Circuit Technology for 10-Gb/s Optical Burst-mode Transmission

Y. Ohtomo, H. Kamitsuna, H. Katsurai, K. Nishimura, M. Noga-wa, M. Nakamura, S. Nishihara, T. Kurosaki, T. Ito, and A. Okada

Proc. of Optical Fiber Communication (OFC), collocated National Fiber Optic Engineers Conference, 2010 Conference on (OFC/NFOEC), pp. 1–3, San Diego, CA, USA, Mar. 2010.

A careful choice of burst-mode 3R receiver circuits achieves fast settling of 200 ns and low power of 1.68 W as well as the optical sensitivity and dynamic range in the 10G-EPON specification.

Parametric Packet-layer Model for Evaluating Audio Quality in Multimedia Streaming Services

N. Egi, T. Hayashi, and A. Takahashi

IEICE Trans. on Commun., Vol. E93-B, No. 6, pp. 1359–1366, 2010.

We propose a parametric packet-layer model for monitoring audio quality in multimedia streaming services such as Internet protocol (IP) television. This model estimates audio quality of experience on the basis of quality degradation due to coding and packet loss of an audio sequence. The input parameters of this model are audio bit rate, sampling rate, frame length, packet-loss frequency, and average burst length. Audio bit rate, packet-loss frequency, and average burst length are calculated from header information in received IP packets. For sampling rate, frame length, and audio codec type, the values or the names used in monitored services are input into this model directly. We performed a subjective listening test to examine the relationships between these input parameters and perceived audio quality. The codec used in this test was the Advanced Audio Codec—Low Complexity, which is one of the international standards for audio coding. On the basis of the test results, we developed an audio quality evaluation model. The verification results indicate that audio quality estimated by the proposed model has a high correlation with perceived audio quality.

Annual Report of Technical Committee on Information Networks

T. Tamura and J. Akiba

IEICE Communications Society GLOBAL NEWSLETTER, Vol. 32, No. 1, p. 5, 2010.

This document presents the annual report of the IEICE Technical Committee on Information Networks for activities from May 2009 to Mar. 2010.

Carrier’s Perspectives for Future Transmission Systems and Networks

S. Matsuoka

Proc. of OECC2010, Vol. 6B2-1, pp. 40–41, Sapporo, Japan, July 2010.

This paper overviews future optical networks over the next few

decades from the carrier viewpoint considering future advanced optical network technologies.

The Number Sense: How the Mind Creates Mathematics

S. Dehaene (author); M. Hasegawa and T. Kobayashi (translators), Hayakawa, 2010.

The Number Sense is an enlightening exploration of the mathematical mind. Describing experiments that show that human infants have a rudimentary number sense. Stanislas Dehaene suggests that this sense is as basic as our perception of color and that it is wired into the brain. Dehaene shows that it was the invention of symbolic systems of numerals that started us on the climb to higher mathematics. A fascinating look at the crossroads where numbers and neurons intersect. This book offers an intriguing tour of how the structure of the brain shapes our mathematical abilities and how our mathematics opens up a window on the human mind.

Phase Equalization-based Autoregressive Model of Speech Signals

S. Hiroya and T. Mochida
Proc. of Interspeech, ISCA, pp. 42–45, Makuhari, Chiba, Japan, Sept. 2010.

This paper presents a novel method for estimating a vocal-tract spectrum from speech signals, based on a modeling of excitation signals of voiced speech. A formulation of linear prediction coding with an impulse train is derived and applied to phase-equalized speech signals, which are converted from the original speech signals by phase equalization. Preliminary results show that the proposed method improves the robustness of the estimation of a vocal-tract spectrum and the quality of re-synthesized speech compared with the conventional method. This technique will be useful for speech coding, speech synthesis, and real-time speech conversion.

Design of Repetitive Knocking Force Display for Being Pulled Illusion

H. Hamaguchi, T. Amemiya, T. Maeda, and H. Ando
Proc. of RO-MAN, IEEE, pp. 33–37, Viareggio, Italy, Sept. 2010.

This paper discusses the design of a knocking force display to induce the kinesthetic illusion of being pulled. Previously, we have found that when a hand-held object oscillates in the hand, if the acceleration pattern is lopsided, one feels a pulling force sensation, although the object does move in two opposite directions. Here, we designed and developed a new force display to generate two imbalanced acceleration patterns in opposing directions. In the display, an internal mass repetitively collides against a wall, to create a spikier pulse than the previous force display could produce. We determined the circumstances under which the sensation of being pulled was perceived by varying the pulse width, i.e., by attaching materials of different stiffnesses to the wall.

A Sub-nanoampere Two-stage Power Management Circuit in 0.35- μm CMOS for Dust-size Batteryless Sensor Nodes

M. Ugajin, T. Shimamura, S. Mutoh, and M. Harada
Proc. of the 2010 International Conference on Solid State Devices and Materials, Vol. 42, No. 1, pp. 347–348, Tokyo, Japan, Sept. 2010.

A sub-nanoampere two-stage power management circuit that uses off-chip capacitors for energy accumulation is presented. Focusing on the leakage current and the transition time of the power switch transistor, we estimated the minimum current for accumulation. On the basis of the results, we devised a two-stage power management architecture for sub-nanoampere operation. The simulation and experimental results for the power management circuit describe the operation for a 1-nA current source.

Ultra-low Leak Regulator Circuits with SOI and Bulk Technologies Controlling Intermittent LSI Operation for Wireless Terminals in Wide Area Ubiquitous Network

M. Ugajin, A. Yamagishi, M. Harada, and Y. Kado
Proc. of the 2010 Asia-Pacific Radio Science Conference, Vol. 3, No. 1, p. D1-2, Toyama, Japan.

New low-leak regulator circuits for battery-equipped wireless terminals are presented. An SOI regulator circuit with a depletion-mode transistor can supply stable current with low battery voltage. A power switch using reversely biased bulk transistors has a very small leak current that is almost the same as that in SOI transistor switches. Measurements showed that battery-equipped wireless terminals with the proposed regulator circuits can operate for more than ten years.

A 16-Gbps Laser-diode Driver with Interwoven Peaking Inductors in 0.18- μm CMOS

T. Kuboki, Y. Ohtomo, A. Tsuchiya, K. Kishine, and H. Onodera
Proc. of the IEEE Custom Integrated Circuits Conference, Vol. 16, No. 5, pp. 569–572, San Jose, CA, USA, Sept. 2010.

A laser-diode (LD) driver with interwoven mutually coupled peaking inductors for high-speed optical networks is presented. Six and four inductors are interwoven into two sets of inductors for area-effective implementation as well as performance enhancement. The proposed circuit is fabricated in CMOS 0.18- μm process. The circuit area is 0.34 mm² and the maximum operating speed is 16 Gbps. Compared with a conventional LD driver in 0.18- μm CMOS, the proposed circuit achieves 1.6 times faster operation and 26% smaller area with 60% reduction in power consumption for the same amount of data transmission and LD driving current.

Report on 8th Asia-Pacific Symposium on Information and Telecommunication Technologies (APSITT 2010)

J. Akiba, N. Kamiyama, T. Tamura, S. Konno, H. Suzuki, K. Ueda, and T. Kawasaki

Proc. of the IEICE Communications Society GLOBAL NEWS-LETTER, Vol. 33, No. 1, pp. 14–15, 2010.

This document describes the 8th Asia-Pacific Symposium on Information and Telecommunication Technologies (APSITT), held at Damai Beach Resort, one hour's drive north of Kuching, the capital of Sarawak, Malaysia, on June 15–18, 2010. This conference was sponsored by the IEICE Communications Society and organized by the Technical Committee on Information Networks and the Technical Committee on Network Systems.

Olfactory Display for Multi-sensory Theater

K. Hirota, Y. Ikei, and T. Amemiya
Proc. of ASIAGRAPH in Tokyo, Vol. 4, No. 2, pp. 24–28, Tokyo,

Japan, Oct. 2010.

This paper describes an approach to implementing an olfactory display that is available in a multi-sensory theater environment for realistic presentation and communication. In our approach, the quantity of odorant emitted into the air, rather than its concentration, is controlled. Compressed air was used for quick emission of odorant, and magnetic valves were used to turn on and off the airflow. The quantity of emission was controlled by changing the duration of the discharge depending on the pressure of the air source; the relationship between the volume of emission and the duration time was analysed on the basis of experimental emissions, and the duration time for a given goal volume was computed by referring to the relationship. It was proved, through experiments using a prototype device, that this approach is feasible.

Confinement of Fluorescent Probes in Microwells on Si Substrates by Sealing with Lipid Bilayers

K. Sumitomo, Y. Tamba, Y. Shinozaki, and K. Torimitsu

Appl. Phys. Express 3, JSAP, Vol. 3, No. 10, pp. 107001-1–107001-3, 2010.

We investigated the optimum architecture for confining fluorescent probes in microwells on a Si substrate by covering it with a lipid bilayer. We modified the structure of the wells to prevent the lipid membrane from falling into them, and the overhang shape at the aperture improved the probability of confinement. The fluorescence intensity from the calcein confined in the wells remained unchanged for one hour or more, indicating that the probes remain stably in the wells without flowing out. An artificial cell sealed with the suspended membrane is a promising tool for the functional analysis of membrane proteins.

An Innovative Rehabilitation Technique for Pipes Containing Cables

T. Yamazaki, T. Korekuni, T. Inamura, T. Harada, H. Omuro, and T. Akiyama

NASTT's No-Dig Conference, ISTT, Vol. 1, No. 2, pp. 1–2, Sun-

tec, Singapore, Nov. 2010.

As optical communication services expand, multiple cable installation has become usual in order to use the limited conduit space effectively. Approximately 3000 km of cables are multi-installed every year. However, more than half of the conduits scheduled for multiple cable installation were diagnosed as inappropriate (mainly owing to rust and corrosion) in preliminary inspections. Excavation-free inspection and renovation technologies for empty conduits have already been developed and used in practice. But because of the risk of damaging existing cables, there are no excavation-free renovation technologies for conduits that already contain cables. Therefore, we have developed cable-containing conduit renovation technologies that enable the repair of unsuitable occupied conduits without excavation and without affecting the cable within; moreover, these technologies maximize the accommodation capacity available after renovation. In this article, we outline the lining materials and renovation methods.

Correction Factors for Field Singularity at 45° Corners in the Finite-difference Analysis of Microstrip Circuits

T. Shibata

Proc. of the Asia-Pacific Microwave Conference 2010, Yokohama, Japan.

In microstrip circuits, the field concentrates at the edges and corners of a thin strip conductor. This yields rapid variation in field strength with its position in their proximity, which might cause a significant error in the finite-difference approximation of the field analysis. The accuracy may be improved by using finer discretization. However, refining the grid in three-dimensional space will soon require huge computational resources. It would be beneficial to improve the accuracy without greatly increasing the analysis cost. To this end, a modification of the finite-difference formulation for the local field singularity was proposed previously. This paper presents correction factors for 45° corners of thin metal plate used for the modification and examines the accuracy improvement in the analysis of microstrip structure.