

# External Awards

## Best Paper Award at 2009 IEEE International Conference on Communications Technology and Applications (ICCTA2009)

**Winners:** Anxin Li, Mingshu Wang, Xiangming Li, and Hidetoshi Kayama, NTT DOCOMO Beijing Laboratories

**Date:** Oct. 16–18, 2009

**Organization:** IEEE Communications Society

For “Iterative channel estimation in the multiuser pilot-assisted CDMA system”.

A joint channel estimation and interference cancellation receiver is presented for a code division multiple access system. To solve the inaccurate reception problem in the pilot part caused by multiple access interference, a novel iterative structure, a partial combining method, and adaptive piecewise polynomial interpolation are proposed. Large performance gains can be achieved especially in high mobility environments.

**Published as:** A. Li, M. Wang, X. Li, and H. Kayama, “Iterative Channel Estimation in the Multiuser Pilot-assisted CDMA System,” Proc. IEEE International Conference on Communications Technology and Applications 2009 (ICCTA '09), Alexandria, Egypt, pp. 535–539, Oct. 2009.

## IEEE GLOBECOM 2009 Best Paper Award

**Winners:** Katsutoshi Kusume<sup>†1</sup>, Gerhard Bauch<sup>†1,2</sup>, and Wolfgang Utschick<sup>†3</sup>

<sup>†1</sup> DOCOMO Communications Laboratories Europe GmbH

<sup>†2</sup> Universität der Bundeswehr München

<sup>†3</sup> Munich University of Technology

**Date:** Nov. 30, 2009

**Organization:** IEEE

For “IDMA vs. CDMA: Detectors, Performance and Complexity”.

This paper presents analytical and numerical comparisons of interleave division multiple access (IDMA) and direct sequence code division multiple access (DS-CDMA) in terms of performance and complexity using an iterative multiuser detection technique. The analysis reveals several advantages of IDMA over DS-CDMA, particularly in highly user loaded scenarios.

**Published as:** K. Kusume, G. Bauch, and W. Utschick, “IDMA vs. CDMA: Detectors, Performance and Complexity,” Proc. IEEE Global Telecommunications Conference (GLOBECOM 2009), Honolulu, HI, USA, Nov./Dec. 2009.

## 2010 Internet Architecture Research Award

**Winners:** Tatsuya Mori, Holly Esquivel, Aditya Akella, Akihiro Shimoda, and Shigeki Goto, NTT Service Integration Laboratories

**Date:** June 17, 2010

**Organization:** Technical Committee on Internet Architecture, Institute of Electronics, Information and Communication Engineers (IEICE) of Japan

For “Understanding the Large-scale Spamming Botnet”.

This paper analyzes the activities of the Srizbi botnet, which is the world worst spamming botnet, through long-term measurement data. It details the rise and steady growth of the Srizbi botnet, as well as, the version transition of Srizbi after the shutdown of its control center.

**Published as:** T. Mori, H. Esquivel, A. Akella, A. Shimoda, and S. Goto, “Understanding the Large-scale Spamming Botnet,” IEICE Tech. Rep., Vol. 109, No. 137, IA2009-31, pp. 53–58, July 2009.

# Papers Published in Technical Journals and Conferences Proceedings

## Efficient 494 mW sum-frequency Generation of Sodium Resonance Radiation at 589 nm by Using a Periodically Poled Zn:LiNbO<sub>3</sub> Ridge Waveguide

T. Nishikawa, A. Ozawa, Y. Nishida, M. Asobe, F.-L. Hong, and T. W. Hänsch

Optics Express, Vol. 17, No. 20, pp. 17792–17800, 2009.

A solid-state-laser-based single-frequency 589 nm light source that can be easily used in the laboratory is needed for sodium spectroscopy studies and cold sodium atom experiments. This paper shows that by using a periodically poled Zn-doped LiNbO<sub>3</sub> ridge

waveguide for sum-frequency generation, we can obtain a high conversion efficiency to 589 nm light from two sub-watt 1064 and 1319 nm Nd:YAG lasers via a simple single-pass wavelength-conversion process without employing an enhancement cavity. A 494 mW light at 589 nm is generated and achieves overall conversion efficiency from the laser power of 41%. Excellent long-term stability of output power is obtained and its standard deviation is characterized to be 0.09%.

### A Re-quantization Noise Reduction Method in MPEG-2 to H.264 Intra Transcoding

T. Yoshitome, K. Kamikura, and N. Kitawaki

Proc. 2009 IEEE Symposium on Industrial Electronics & Applications (ISIEA 2009), Vol. 1, pp. 94–99, Kuala Lumpur, Malaysia, Oct. 2009.

An MPEG-2 to H.264 intra transcoding method is proposed. This method uses the encoding information from an MPEG-2 stream and keeps as many DCT coefficients of the original MPEG-2 bitstream as possible. Experimental results show that the proposed method improves PSNR by about 0.76–1.27 dB compared with a typical conventional method.

### Developing of Higher Voltage Direct-current Power-feeding Prototype System

T. Babasaki, T. Tanaka, Y. Nozaki, T. Tanaka, T. Aoki, and F. Kurokawa

Proc. 31st International Telecommunications Energy Conference (INTELEC 2009), pp. 1–5, Incheon, Korea, Oct. 2009.

High efficiency power feeding systems are effective solutions for reducing the power consumption of ICT equipment, such as routers and servers, or high efficiency cooling systems. We developed a higher voltage direct current (HVDC) power feeding system prototype. This system is composed of a rectifier, power distribution cabinet, batteries, and ICT equipment. The configuration is similar to a –48 V DC power supply system. The output of the rectifier is 100 kW, and the output voltage is 401.4 V. We describe the advantage of an HVDC power feeding system and show that its basic characteristics are stable.

### Passive Acoustic Sensing of Walking

M. Shoji

Proc. 5th International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP 2009) Melbourne, Australia, Dec. 2009.

Acoustic sensing is expected to have a wide variety of practical applications. Sensing of a human walking based on only passive acoustic information was studied experimentally. A simple microphone array consisting of four omnidirectional microphones and a common methodology of signal processing were employed to detect the positions of footsteps. The performance of the system was examined by evaluating the success rate and the spatial error of localization (position estimation) for footsteps in an indoor environment. The results showed that the system was capable of localization and tracking of footsteps within a radius of 3–4 m on the floor. The system can estimate the stride length, speed, and direction of the walking. The performance of real-time localization of footsteps was also evaluated.

### Degradation Analysis of InP Buried Heterostructure Layers in Lasers Using Optical-Beam-Induced-Current Technique

T. Takeshita, T. Sato, M. Mitsuhashi, Y. Kondo, and H. Ohashi

IEEE Transactions on Device and Materials Reliability, Vol. 10, No. 1, pp. 142–148, Mar. 2010.

The degradation of InP buried heterostructure layers in lasers during constant-power aging is investigated by using the optical-beam-induced-current (OBIC) technique. An increase in OBIC intensity

after aging is detected in the InP layer, and it is shown that the carrier concentration around the p-type InP buried layer of the mesa sidewall is decreased by aging. This technique is useful for detecting changes in the carrier concentration in InP areas of several micrometers in lasers by using the incident light absorbed in the InP layer.

### Kinesthetic Illusion of Being Pulled Sensation Enables Haptic Navigation for Broad Social Applications

T. Amemiya, H. Ando, and T. Maeda

Advances in Haptics, INTECH, pp. 403–414, Apr. 2010.

Many handheld force-feedback devices have been proposed to provide a rich experience with mobile devices. However, previously reported devices have been unable to generate both constant and translational force. They can only generate transient rotational force since they use a change in angular momentum. Here, we exploit the nonlinearity of human perception to generate both constant and translational force. Specifically, a strong acceleration is generated for a very brief period in the desired direction, while a weaker acceleration is generated over a longer period in the opposite direction. The internal human haptic sensors do not detect the weaker acceleration, so the original position of the mass is “washed out”. The result is that the user is tricked into perceiving a unidirectional force. This force can be made continuous by repeating the motions. This chapter describes the pseudoattraction force technique, which is a new force feedback technique that enables mobile devices to create the sensation of two-dimensional force. A prototype was fabricated in which four slider-crank mechanism pairs were arranged in a cross shape and embedded in a force feedback display. Each slider-crank mechanism generates a force vector. By using the sum of the generated vectors, which are linearly independent, the force feedback display can create a force sensation in any arbitrary direction on a two-dimensional plane. We also introduce an interactive application with the force feedback display, an interactive robot, and a vision-based positioning system.

### A Fluid Model of Generating 3D Dynamic Images from a Single 2D Image

H. Sakaino

The Journal of the Institute of Image Information and Television Engineers, Vol. 64, No. 4, pp. 551–562, 2010.

An animation method for creating 3D motion effects from a single realistic, fluid-like 2D image/photo is developed. Several 3D basic velocity patterns with 3D Navier Stokes equations are designed to provide time-dependent motion for a 2D image. Their velocity patterns are transformed onto a 2D image plane by using perspective transformation, and a 2D advection equation is used to generate a new image sequence. Two GUIs are also developed to allow quick motion generation by mouse, integrated with image-matting and image in-painting methods. For continuing textural changes, source and sink regions can be defined and used as well. Experiments with 3D visual effects using single images, such as a cloud and a waterfall, are described. Results show that our proposed image generation method and GUI have quick operability with less-distorted textures.

### Extremely High Peak Current Densities of over $1 \times 10^6$ A/cm<sup>2</sup> in InP-based InGaAs/AlAs Resonant Tunneling Diodes Grown by Metal-organic Vapor-phase Epitaxy

H. Sugiyama, H. Yokoyama, A. Teranishi, S. Suzuki, and M. Asada

Jpn. J. Appl. Phys. Vol. 49, p. 051201, 2010.

InP-based InGaAs/AlAs resonant tunneling diodes (RTDs) with extremely high peak current density ( $j_p$ ) were grown by metal-organic vapor-phase epitaxy. High-temperature growth at 660°C provides high-quality heterointerfaces and excellent current-voltage ( $I$ - $V$ ) characteristics. To obtain extremely high  $j_p$ , the structural parameter dependence of  $I$ - $V$  characteristics on barrier and spacer thicknesses and emitter-doping concentration were examined. Clear exponential dependence of  $j_p$  on barrier thickness was obtained in the barrier-thickness range from 1.2 to 2.8 nm. The reduction of spacer thickness to 2 nm increased  $j_p$  without deteriorating the peak-to-valley current

ratio (PVR). An investigation of Si dopant diffusion into double-barrier regions at the growth temperature supports the validity of reducing the spacer thickness. The  $j_p$  increased as Si doping concentration was increased from  $1 \times 10^{18}$  to  $6 \times 10^{18} \text{ cm}^{-3}$  in InGaAs emitters. The highest  $j_p$  reached  $1.29 \times 10^6 \text{ A/cm}^2$  with a PVR of 1.5 in an RTD at room temperature with barrier and spacer thicknesses of 1.4 and 2 nm and Si doping concentration in the emitter of  $6 \times 10^{18} \text{ cm}^{-3}$ .

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