External Awards

BIRTV Award (Radio and Television Transmission and Delivery)

Winner: Akihiko Hirata[†1], Ryoichi Yamaguchi[†1], Hiroyuki Takahashi[†1], Naoya Kukutsu[†1], Yuichi Kado[†1], and Toshihiko Kosugi[†2]

†1 NTT Microsystem Integration Laboratories

†2 NTT Photonics Laboratories

Date: August 21, 2007

Organization: Beijing International Radio, TV & Film Equipment Exhibition (BIRTV2007)

For "NTT 120-GHz-band wireless link".

120-GHz-band wireless link system which can transmit data at 10 Gbit/s was exhibited at BIRTV2007, held in Beijing, China, for four days from August 22nd to 25th in cooperation with Fuji Television Network Inc. This system can transmit up to six channels of uncompressed high-definition TV signals, which cannot be achieved with the wireless transmission equipment for the current broadcasting. In addition, it provides low power consumption that enables battery-driven operation. The above-mentioned features were evaluated, and it won the prize.

References: A. Hirata, R. Yamaguchi, Y. Sato, T. Mochida, and K. Shimizu, "Multiplexed Transmission of Uncompressed HDTV Signals Using 120-GHz-band Millimeter-wave Wireless Communications System," NTT Technical Review, Vol. 4, No. 3, pp. 64–70, 2006.

12th OptoElectronics and Communications Conference and 16th International Conference on Integrated Optics and Optical Fiber Communication (OECC/IOOC 2007) Best Paper Award

Winner: Yusuke Yamada, Kunihiro Toge, and Kazuo Hogari, NTT Access Network Service Systems Laboratories

Date: July 11, 2007

Organization: OptoElectronics and Communications Conference and International Conference on Integrated Optics and Optical Fiber Communication (OECC/IOOC)

For "Ultra-high-density optical fiber cable and its application as pre-connectorized cable with adjustable excess length".

This paper proposes a small diameter and ultra-high-density 100-fiber cable with a low bending loss optical fiber and pre-connectorized cable with adjustable excess length. We confirmed the stable optical loss characteristics of these cables. We also confirmed the low connection loss in the preconnectorized cable when we use a hole-assisted optical fiber. We revealed the feasibility of the proposed cables for practical use.

References:

1 N. Segawa, T. Kashiwagi, S. Shibata, T. Yamada, Y. Iriyama, A. Ogiwara, S. Maeda, and N. Fujikura, "Increasing the Level of Infrastructure Facilities Management," NTT Technical Review, Vol. 4, No. 6, pp. 17–23, 2006.

2 ITU-T Recommendation G. 652.

3 K. Nakajima, K. Hogari, J. Xhou, K. Tajima, and I. Sankawa, "Hole-assisted fiber design for small bending and splice losses," IEEE PTL, Vol. 15, No. 12, pp. 1737–1739, 2003.

4 S. Matsuo, M. Ikeda, H. Kutami, and K. Himeno, "Low-Bending-Loss and Low-Splice-Loss Single-Mode Fibers Employing a Trench Index Profile," LEICE Trans. on Electronics, Vol. E88-C, No. 5, pp. 889–895, 2005.

5 K. Suto, Y. Banda, S. Tomita, and T. Tsuchiya, "Optical Reciever Design Considering Fiber Loss Fluctuation for Subscriber Loops," IEICE Trans. on Communications, Vol. E74-B, No. 3, pp. 547–554, 1991.

6 T. Satake, S. Nagasawa, and R. Arioka, "A new type of demountable plastic-molded single-mode multifiber connector," IEEE JLT, Vol. 4, No. 8, pp. 1232–1236, 1986.

7 K. Shibata, M. Takaya, K. Hogari, I.. Sankawa, and T. Haibara, "High-Speed MT Connector Assembly Method," IEICE Trans. on Communications, Vol. E89-B, No. 2, pp. 413–418, 2006.

Papers Published in Technical Journals and Conferences

Infrared Detection with Silicon Nano-field-effect Transistors

K. Nishiguchi, Y. Ono, A. Fujiwara, and H. Yamaguchi

Appl. Phys. Lett., AIP, Vol. 90, No. 22, pp. 223108-1–223108-3, 2007.

The authors fabricated nanoscale silicon metal-oxide-semiconductor field-effect transistors (MOSFETs) to detect an infrared (IR) signal at room temperature. The IR signal excites conduction-band electrons in an undoped channel of a MOSFET and some of them are injected through an energy barrier into a storage node (SN) electrically formed by the MOSFET. Small signals, originating from electrons, stored in the SN are detected by an electrometer with single-electron resolution. Additionally, the MOSFET controls the number and energy of electrons injected into the SN. This enables electrical control of the sensitivity and cutoff wavelengths of IR signals, suggesting the possibility of highly functional IR sensors.

The Nearest Polynomial with a Zero in a Given Domain

H. Sekigawa

Symbolic-Numeric Computation '07 (SNC2007), University of Western Ontario, pp. 190–196, London, 2007.

For a real univariate polynomial f and a bounded closed domain D

$\subset$ C whose boundary C is a simple closed curve of finite length and is represented by a piecewise rational function, we provide a rigorous method for finding the real univariate polynomial $\tilde{f}$ such that $\tilde{f}$ has a zero in D and $||f-\tilde{f}||_\infty$ is minimal. First, we prove that the absolute value of every coefficient of $f-\tilde{f}$ is $||f-\tilde{f}||_\infty$ with at most one exception. Using this property and the representation of C, we reduce the problem to solving systems of algebraic equations, each of which consists of two equations with two variables. Furthermore, every equation is of degree one with respect to one of the two variables.

Minimum Converging Precision of the QR-factorization Algorithm for Real Polynomial GCD

P. Khungurn, H. Sekigawa, and K. Shirayanagi

ISSAC2007, ACM, pp. 227–234, Waterloo, 2007.

Shirayanagi and Sweedler proved that a large class of algorithms over the reals can be modified slightly so that they also work correctly on fixed-precision floating-point numbers. Their main theorem states that, for each input, there exists a precision, called the minimum converging precision (MCP), at and beyond which the modified "stabilized" algorithm follows the same sequence of instructions as that of the original "exact" algorithm. Bounding the MCP of any nontrivial and useful algorithm has remained an open problem.

This paper studies the MCP of an algorithm for finding the GCD of two univariate polynomials based on the QR-factorization. We show that the MCP is generally incomputable. Additionally, we derive a bound on the minimal precision at and beyond which the stabilized algorithm gives a polynomial with the same degree as that of the exact GCD, and another bound on the minimal precision at and beyond which the algorithm gives a polynomial with the same support as that of the exact GCD.

Widely Tunable 2.3-μm-band Difference Frequency Generation in Quasiphase-matched $LiNbO_3$ Ridge Waveguide Using Index Dispersion Control

O. Tadanaga, T. Yanagawa, Y. Nishida, K. Magari, T. Umeki, M. Asobe, and H. Suzuki

J. Appl. Phys., AIP, Vol. 102, No. 3, pp. 033102-1–033102-5, 2007.

We describe widely tunable 2.3-μm difference frequency generation in direct-bonded quasiphase-matched (QPM)-$LiNbO_3$ (LN) ridge waveguides by controlling the refractive index dispersion. We calculate the phase matching characteristics of waveguides with various core areas for a fixed pump wavelength of 0.934 μm and show that a larger core area results in a wider signal tuning range in the 1.55-μm band. Based on the calculation, we fabricate QPM-LN ridge waveguides with two different waveguide core sizes. A wide tuning range of over 173 nm with a conversion efficiency of 56%/W is demonstrated in the 2.3-μm range using the waveguide with the larger core size. We also carry out CO gas measurements using a signal wavelength in the telecommunication band and detect 44 lines of the CO absorption owing to the wide tuning range and efficient conversion efficiency of the waveguide.

Lighting Independent Skin Tone Detection Using Neural Networks

M. Decker and M. Sawaki

IEICE Trans., Vol. E90-D, No. 8, pp. 1195–1198, 2007

Skin tone detection in conditions where illuminate intensity and/or chromaticity can vary often comes with high computational time or low accuracy. Here a technique is presented integrating chromaticity and intensity normalization combined with a neural skin tone classification network to achieve robust classification faster than other approaches.
