Papers Published in Technical Journals and Conferences

Report on the 25th NS/IN Research Workshop

D. Arai, M. Isomura, J. Akiba, T. Tamura, H. Suzuki, H. Morikawa, I. Inoue, T. Miyoshi, T. Miyamura, G. Kimura, and M. Yamamoto

Global Newsletter, IEICE, Vol. 28, No. 1, pp. 15–25, 2009.

The 25th NS/IN Research Workshop took place in Okinawa, Japan, March 2–3, 2009. The workshop was sponsored by the technical committee on NS (Network Systems) and IN (Information Networks) of the IEICE Communication Society and aimed to discuss the technical direction and research topics for future networks. A record showing of 156 participants underscored the success of the workshop. The overall theme of the workshop was "The Network Neutrality in the IP era." The workshop featured invited talks, an overview of them, and a panel discussion.

Analysis of Network Coding in Slotted ALOHA with Two-Hop Bidirectional Traffic

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IEEE ICC 2009, Proc., Vol. 1, No. 1, pp. 1–5, Dresden, Germany.

This paper deals with two representative bidirectional traffic cases in two-hop wireless relay access systems using network coding and a slotted ALOHA protocol. Network coding is a recent and highly regarded technology for capacity enhancement of multiple unicast and multisource multicast networks. The relay nodes are generally involved with unbalanced multidirectional traffic, but the impact of the unbalanced traffic on network coding has not been analyzed. This paper provides closed-form expressions for the throughput and packet delay for two-hop bidirectional traffic cases both with and without network coding even if the buffers on nodes are unsaturated. The analytical results are mainly derived by solving queueing systems for the buffer behavior at the relay node. The results show that the transmission probability of the relay node is a design parameter that is crucial for maximizing the achievable throughput of slotted ALOHA systems with network coding in two-hop bidirectional traffic cases.

Reliable 2.3-μm Wavelength Highly Strained InAs-InP MQW-DFB Lasers with p-/n-InP Buried Heterostructure

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IEEE Photon. Technol. Lett., IEEE, Vol. 21, No. 13, pp. 896–898, 2009.

We have made reliable 2.3-μm wavelength InAs-InP multiquantum-well distributed-feedback (DFB) lasers for trace gas monitoring applications. The estimated median lifetime exceeds 1×10^5 hours during aging at an ambient temperature of 45ºC and with a constant output power of 3 mW. Furthermore, the relative increase in operating current is proportional to the square root of time, and we have clarified that the main degradation mechanism in DFB lasers with highly strained InAs quantum wells is dominated by a diffusion process as found with conventional telecommunication lasers.

Portable Two-dimensional Direction Indicator with a Pseudo-Attraction Force

T. Amemiya

IEEE Portable 2009, Proc., Vol. 1, No. 1, p. 14-02-0, Anchorage, Alaska, USA.

This paper describes a portable force-feedback device based on asymmetric oscillation that exploits the characteristics of human perception. Our previous results with a one-degree-of-freedom prototype device indicated that the kinesthetic illusion of being pulled is effectively generated within appropriate frequencies in one direction. The objective of this study is to develop a portable device that presents haptic information in any arbitrary direction on a two-dimensional plane. A 12-cm-diameter haptic display was designed and built. In the display, the single-speed rotational cyclic movement of a motor is converted into asymmetric translational cyclic movement with asymmetric acceleration via a hybrid configuration comprising cam and swinging slider-crank mechanisms, tricking the user into perceiving a unidirectional force. A haptic display that accommodates four hybrid-mechanism modules has been implemented. The perceived force direction is determined by combining the force vectors generated by the module in the force display. The design reduces the size of the haptic display and gear noise. The results of a psychophysical experiment suggest that people who hold the device can perceive the predefined directional force intuitively.

Knowledge inheritance system in an organization with rapid personnel turnover

S. Hashimoto, Y. Seki, and H. Suwa

GN Workshop 2009, IPSJ, Vol. 2009, No. 8, pp. 105–110, 2009 (in Japanese).

In organizations where members are replaced every few years, information that should be passed on to newcomers may not be properly passed on. This is thought to be caused by several factors: it is not clear who should receive the information, the format has not yet been set, it is easy to forget to do this task, the motivation to do it is weak, etc. We are developing a knowledge inheritance system called LEAVES for passing notes onto newcomers. We conducted a questionnaire survey as a pilot study to find out what information should be passed on. We determined that the information that should be collected as notes was incomplete, so we manually added the missing information using the 5W1H concept (who, what, where, when, why, and how) and simulated a LEAVES scenario. We then performed a verification experiment using the scenario and turned our attention to automation.

Haptic Handheld Wayfinder with Pseudo-Attraction Force for Pedestrians with Visual Impairments

T. Amemiya and H. Sugiyama

ACM ASSETS 2009, Proc. Vol. 1, No. 1, pp. 107–114, Pittsburgh, PA, USA.

When visually impaired pedestrians walk from one place to another by themselves, they must update their orientation and position to find their way and avoid obstacles and hazards. We present the design of a new haptic direction indicator, whose purpose is to help blind pedestrians travel a path and avoid hazards intuitively and safely by means of haptic navigation. The haptic direction indicator uses a novel kinesthetic perception method called the "pseudo-attraction force" technique, which exploits the nonlinear relationship between perceived and physical acceleration to generate a force sensation. In an experiment performed to evaluate the haptic direction indicator, we found that visually impaired users could safely walk along a predefined route at their usual walking pace without any audi-

tory information. These results demonstrate the utility and usability of the haptic direction indicator, but there is still room for improvement.

Involvement of the Thalamocortical Loop in the Spontaneous Switching of Percepts in Auditory Streaming

H. M. Kondo and M. Kashino

J. Neurosci., Society for Neuroscience, Vol. 29, No. 40, pp. 12695–12701, 2009.

Perceptual grouping of successive frequency components, namely, auditory streaming, is essential for auditory scene analysis. Prolonged listening to an unchanging triplet-tone sequence produces a series of illusory switches between a single coherent stream (S1) and two distinct streams (S2). The predominant percept depends on the frequency difference (Δf) between high and low tones. Here, we combined the use of different Δfs with an event-related functional magnetic resonance imaging (fMRI) design to identify whether the temporal dynamics of brain activity differs depending on the direction of perceptual switches. The results demonstrated that the activity of the medial geniculate body (MGB) in the thalamus occurred earlier during switching from nonpredominant to predominant percepts, whereas that of the auditory cortex (AC) occured earlier during switching from predominant to nonpredominant percepts, regardless of Δf. The asymmetry of temporal precedence indicates that the MGB and AC activations play different roles in perceptual switching and depend on perceptual predominance rather than on S1 and S2 percepts per se. Our results suggest that feedforward and feedback processes in the thalamocortical loop are involved in the formation of percepts in auditory streaming.

Geometrical effect in submicrometer channel organic field effect transistors

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Thin Solid Films, Elsevier, Vol. 518, No. 2, pp. 579–582, 2009.

The electrical behaviors of submicrometer bottom-gate bottom-contact organic field effect transistors (OFETs) with submicrometer channel lengths and channel widths were investigated. Short-channel effects (SCEs) were observed for devices with shorter channel lengths and wider channel widths. The SCEs were effectively suppressed by reducing the channel width to 50 nm. The relationship between the drain current density and the drain voltage normalized by their respective channel lengths revealed that the drain current characteristics of shorter length channels fall into two types: parasitic contact resistances at lower drain voltage and SCEs caused by the space charge limiting current at higher drain voltages. The carrier mobility was also investigated and found to be enhanced in the narrower channel width.