Papers Published in Technical Journals and Conferences

Feature-tracking mechanism dominates motion perception as the retinal illuminance decreases

T. Takeuchi and K. K. De Valois

Vision Sciences Society, Vol. 8, No. 6, p. 121, Naples, FL, USA, June 2008.

When a sine-wave grating moves by 90°, the perceived direction of motion depends on the duration of inter-stimulus interval (ISI). Here, we measured the effect of ISI on the perceived direction of moving gratings at different retinal illuminances and eccentricities. Subjects judged the perceived direction of moving gratings. Under photopic conditions, at 20° eccentricity, motion reversal was stronger with short ISIs, and perception did not become veridical at longer ISIs. Under mesopic and scotopic conditions, motion reversal disappeared in central vision, but strong motion reversal was still observed in the periphery. This suggests that both first-order and feature-tracking mechanisms operate in the central visual fields, while the first-order motion mechanism dominates strongly in the peripheral visual field.

Information Security by Formal Methods

K. Fujita

ITU Journal, The ITU Association of Japan, Vol. 38, No. 8, pp. 22–23, Aug. 2008.

We are trying to apply formal methods for network and information security at NTT Communication Science Laboratories. In this article, the following research topics are introduced.

1) Provable anonymity and privacy.

2) Formal foundations for digital rights management.

Addition on a Linear Nearest Neighbor Architecture

Y. Takahashi and N. Kunihiro

Asian Conference on Quantum Information Science, Korea Institute for Advanced Study, Vol. 1, No. 1, pp. 139–140, Seoul, Korea, Aug. 2008.

We show how to construct an efficient quantum circuit for computing the sum of two n-bit binary numbers on a linear nearest neighbor architecture. When the input and output binary numbers are arranged on a linear nearest neighbor architecture in an interleaved manner, the circuit uses no ancillary qubits and its depth and size are $O(n)$. When there is no restriction on the arrangement, the circuit also uses no ancillary qubits and has the same asymptotic depth $O(n)$, and its size is at most $O(n^2)$. This shows that Cuccaro et al.'s question can be answered affirmatively on a linear nearest neighbor architecture.

Highly Stable 1.3-μm-wavelength Lasers with p-and n-InP Buried Heterostructure

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IEEE Trans. Device and Materials Reliability, Vol. 8, No. 3, pp. 576–581, Sept. 2008.

Highly stable 1.3-μm-wavelength Fabry-Perot lasers with a p- and n-type InP buried heterostructure have been achieved at an ambient temperature of 85ºC. The $t^{0.5}$ deterioration (second-stage degradation) property does not appear clearly within 6000 h, and the saturated first-stage degradation property remains. It is confirmed that the fabricated 1.3-μm FP lasers have a different optical-beam-induced-current characteristic from lasers suffering from $t^{0.5}$ deterioration.

The first-stage degradation is due to the deterioration of the active layer and is attributed to the fact that some nonradiative recombination centers are generated in the active layer.

Visual search of moving natural images

T. Takeuchi, T. Sugiyama, and H. Imai

ECVP 2008, European Conference on Visual Perception, Vol. 37, p. 55, Utrecht, The Netherlands, Sept. 2008.

A visual search based on objects' motion directions or speeds is known to be efficient if differences between the motion components of the target and distractors are large. Here we asked whether a visual search of moving natural images is similarly efficient. The visual stimuli used comprised 20 movies including such moving objects as a car, animals, and landscape. When the target was a movie played forwards, the distractors were the same movie played backwards, and vice versa. When each stimulus was presented alone for a short duration (less than 100 ms), subjects could correctly indentify whether it was being played forwards or backwards. However, in the visual search condition, even though all objects in each stimulus moved in opposite directions in the target and the distractors, we found that the visual search was inefficient. A significant set-size effect was observed for most of the movies. No search asymmetry was observed except when the stimulus contained expanding/contracting motions. These results suggest a limitation in the allocation of attentional resources in a visual search.

Advanced Internet Congestion Control Using a Disturbance Observer

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

IEEE GLOBECOM 2008, Vol. 1, No. CQ05T2, pp. 1–5, New Orleans, 2008.

This paper presents a novel Internet congestion control scheme, the active queue management (AQM) scheme, that supports transmission control protocol (TCP) flows and avoids serious congestion by suppressing bottleneck nodes. The proposed controller includes a proportional-derivative (PD) controller and a disturbance observer (DOB). PD control is performed to keep the queue length below the buffer size, and the DOB is implemented for robust congestion control. The DOB can estimate and compensate for the variations in network parameters, e.g., the number of TCP connections. This paper also describes a design methodology for the proposed congestion controller including the PD controller and the DOB. The validity of the proposed method is shown by simulation results.

"WHO IS THIS" QUIZ DIALOGUE SYSTEM AND USERS' EVALUATION

M. Sawaki, Y. Minami, R. Higashinaka, K. Dohsaka, and E. Maeda

2008 IEEE Workshop on Spoken Language Technology, Vol. 1, No. 1, pp. 149–152, Goa, India, 2008.

In order to design a dialogue system that users enjoy and want to be near for a long time, it is important to know the effect of the system's action on users. This paper describes a "Who is this" quiz dialogue system and its users' evaluation. Its quiz-style information presentation has been found effective for educational tasks. In our

ongoing effort to make it closer to a conversational partner, we implemented the system as a stuffed-toy (or CG equivalent). Quizzes are automatically generated from Wikipedia articles, rather than from hand-crafted sets of biographical facts. Network mining is utilized to prepare adaptive system responses. Experiments showed the effectiveness of personal network and the relationship between user attribute and interest level.

Proposal of a Novel EMI Diagnostic System using Independent Component Analysis

M. Masugi, N. Hirasawa, R. Kobayashi, K. Tajima, and H. Yamane

EMC Zurich 2009, Swiss Federal Institute of Technology Zurich, Vol. 1, No. 1, pp. 417–420, Zurich, Switzerland, 2009.

This paper presents a noise diagnosing system that can separate multiple interfering signals due to crosstalk or common-mode noise problems. In estimating original time-series signals from measured data sets, our system uses the independent component analysis (ICA) scheme, which uses a statistical technique to separate blind source signals from measured data sets. In addition, mutual-correlation coefficients between separated and measured signals are used to obtain a set of measured and estimated signals. Evaluations of transmission lines confirmed that our system is effective for diagnosing multiple electromagnetic interference (EMI) problems, resulting in the mutual-correlation coefficients between the original and estimated signals being more than 0.9 for 1–20 MHz sinusoidal signals.

Close Similarity Between Spatiotemporal Frequency Tunings of Human Cortical Responses and Involuntary Manual Following Responses to Visual Motion

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Journal of Neurophysiology, American Physiological Society, Vol. 101, No. 1, pp. 888–897, 2009.

The human brain uses visual motion inputs not only for generating subjective sensation of motion but also for directly guiding involuntary actions. Here we show a surprising degree of similarity between the manual following response (MFR) and the population neural activity measured by magnetoencephalography (MEG). We measured the MFR and MEG induced by the same motion onset of a large-field sinusoidal drifting grating with changing spatiotemporal frequency of the grating. The initial transient phase of these two responses had very similar spatiotemporal tunings. Specifically, both the MEG and MFR amplitudes increased as the spatial frequency was decreased to, at most, 0.05 c/deg, or as the temporal frequency was increased to, at least, 10 Hz. Our results suggest a close relationship between the properties of involuntary motor responses and motion-evoked cortical activity as reflected by the MEG.

The Design and Implementation of the NILFS Log-Structured File System

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ASC, Information Processing Society of Japan, Vol. 2, No. 1, pp. 110–122, 2009.

This paper describes the design and implementation of the NILFS log-structured file system. NILFS provides file system snapshots at any point in time and protects data from software failures and user errors. The log-structured disk layout maintains on-disk data structures consistently and achieves fast recovery from system failures. Unlike other log-structured file systems, the cleaner can reclaim obsolete disk space efficiently under the existence of multiple snapshots using disk address translation mechanisms. The results of evaluation experiments show that the performance of NILFS is comparable to that of Ext3.

Generalization of Hadamard Matrices and its Application

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Management and Information, Univ. of Shizuoka, Vol. 21, No. 2, pp. 15–27, 2009.

In this paper we define "generalized Hadamard matrices" and construct them for order n when $n = 2^m$ (m=1, 2, ... 8). We show how multiple regression based on generalized Hadamard matrices can be analysed efficiently. In addition, we propose a generalized experimental design and describe how to apply generalized Hadamard matrices to it.

Haptic Direction Indicator for Visually Impaired People Based on Pseudo-Attraction Force

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eMinds: Int. J. Human-Computer Interaction, The Human Communication and Interaction Research G, Vol. 1, No. 5, pp. 23–34, 2009.

Wayfinding is of vital importance if visually impaired pedestrians are to walk by themselves from one place to another, since they must calculate both their orientation and position. Here, a new haptic direction indicator is proposed, which will help blind pedestrians to avoid hazardous areas intuitively and safely by means of haptic navigation. A novel translational force perception method, called the "pseudo-attraction force" technique, is applied to a haptic direction indicator, which exploits the nonlinear relationship between perceived acceleration and physical acceleration to generate a force sensation. An experiment was performed to clarify the perceptual characteristics when a visually impaired person held the haptic direction indicator. The results indicate that the angular resolution of directional force under 8-direction (compass) conditions was better than that under 12-direction (clock position) conditions with the haptic direction indicator. The finding constitutes a criterion for designing smaller haptic direction indicators.