External Awards

IEICE Communications Society Excellent Paper Award, Best Paper Award

Winner: Kiyoshi Ueda[†1], Hiroshi Sunaga[†2], Toshiyuki Oka[†1], and Hiroaki Matsumura[†1]

†1 NTT Network Service Systems Laboratories

†2 NTT Network Innovation Laboratories

Date: September 17, 2008

Organization: IEICE Communications Society

For "P2P-Based Advanced Grid Architecture Integrating Computing- and Data-Grids".

This paper describes an advanced grid architecture that can reduce total turn around time by integrating the properties of a computing-grid and data-grid through peer-to-peer (P2P) communication. We propose two methods for data handling and job control: a data-oriented peer selection method and a method in which the job processing peer gets the data through P2P file sharing.

Maejima Award

Winner: Masahiro Morikura[†1], Masato Mizoguchi[†2], and Takeshi Onizawa[†3]

†1 Kyoto University

†2 NTT Network Innovation Laboratories

†3 NTT Information Sharing Laboratory Group

Date: October 31, 2008

Organization: Teishin Association

For a series of activities related to the development of orthogonal-frequency-division-multiplexing-based wireless local area network systems.

*This annual award is given to people who have contributed greatly to telecommunication fields.

Papers Published in Technical Journals and Conferences

Collaborative processing in mote-based sensor/actuator networks for environment control application

M. Nakamura, A. Sakurai, S. Furubo, and H. Ban

Signal Processing, Elsevier, Vol. 88, pp. 1827–1838, 2008.

This paper describes in the framework of optimization a collaborative sensing and actuation system for environment control. In the collaborative sensing, the sensor network topology is self-configured according to the sensing information to optimize a sensing utility. Experimental results using motes show that the algorithm provides the sensor network topology allocating resources to sensing nodes. The server can robustly gather the sensing data from all sensor nodes using the collaborative sensing algorithm, and calculate the control signals for actuators to balance the energy saving against the quality of the control signals. In addition to a centralized approach, a decentralized algorithm is also proposed to calculate the control signals. Simulations reveal that the decentralized algorithm can provide the same performance as the centralized approach. We also demonstrate its accuracy and efficiency performance using the motes and compare it with the simulation.

Robust Speech Recognition by Model Adaptation and Normalization Using Pre-Observed Noise

S. Kobashikawa and S. Takahashi

Trans. IEICE Jpn, Vol. E91, No. 3, pp. 422–429, 2008.

Users require speech recognition systems that offer rapid response and high accuracy concurrently. Speech recognition accuracy is degraded by additive noise, imposed by ambient noise, and convolutional noise, created by space transfer characteristics, especially in distant talking situations. Against each type of noise, existing model adaptation techniques achieve robustness by using HMM-composition and CMN (cepstral mean normalization). Since they need an additive noise sample as well as a user speech sample to generate the models required, they can not achieve rapid response, though it may be possible to catch just the additive noise in a previous step. In the previous step, the technique proposed herein uses just the additive noise to generate an adapted and normalized model against both types of noise. When the user's speech sample is captured, only online-CMN need be performed to start the recognition processing, so the technique offers rapid response. In addition, to cover the unpredictable signal-to-noise (S/N) values possible in real applications, the technique creates several S/N HMMs. Simulations using artificial speech data show that the proposed technique increased the character correct rate by 11.62% compared to CMN.

Aluminum nitride deep-ultraviolet light-emitting p-n junction diodes

Y. Taniyasu and M. Kasu

Diamond and Related Materials, Elsevier, Vol. 17, pp. 1273–1277, 2008.

This paper reviews our work on aluminum nitride (AlN) p-n junction light-emitting diodes (LEDs). N-type AlN was obtained by Si doping. By reducing dislocation density in n-type Si-doped AlN, we achieved a room-temperature electron mobility of 426 $cm^2V^{-1}s^{-1}$. We analyzed the temperature dependence of the electron mobility and how the electron mobility is limited by specific scattering mechanisms. p-type AlN was obtained by Mg doping and its acceptor ionization energy was estimated to be 630 meV. We fabricated AlN p-n junction LEDs and observed electroluminescence (EL) with a wavelength of approximately 210 nm, the shortest wavelength ever observed among semiconductors. The EL was assigned to the near-

band-edge emission of AlN.

Asymmetric Oscillation Distorts the Perceived Heaviness of Handheld Objects

T. Amemiya and T. Maeda

IEEE Trans. on Haptics, Vol. 1, No. 1, pp. 9–18, 2008.

Weight perception has been of great interest for over three centuries. Most research has been concerned with the weight of static objects, and some illusions have been discoverd. Here, we show a new illusion related to the perception of the heaviness of oscillating objects. We performed experiments that involved comparing the weight of two objects of identical physical appearance but with different gross weights and oscillation patterns (vibrating vertically at frequencies of 5 or 9 cycles/s with symmentric and asymmetric acceleration patterns). The results show that the perceived weight of an object vibrating with asymmetric acceleration increases compared to that with symmetric acceleration when the acceleration peaks in the gravity direction. In contrast, almost no heaviness perception change was observed in the antigravity direction. We speculate that the reason for the divergence between these results is caused by the differential impact of these two hypothesized perceptual mechanisms as follows: the salience of pulse stimuli appears to have a strong influence in the gravity direction, whereas filling-in could explain our observations in the antigravity direction. The study of this haptic illusion can provide valuable insights into not only human perceptual mechanisms but also the design of ungrounded haptic interfaces.

Reactivity of $LaNi_{0.6}Fe_{0.4}O_3$ With Samaria-doped Ceria

H. Arai, R. Chiba, T. Komatsu, H. Orui, S. Sugita, Y. Tabata, K. Nozawa, K. Watanabe, M. Arakawa, and K. Sato

Journal of Fuel Cell Science and Technology, American Society of Mechanical Engineering, Vol. 5, No. 3, pp. 031204-1–031204-5, 2008.

$LaNi_{0.6}Fe_{0.4}O_3$ (LNF) is one of the promising cathodes for solid oxide fuel cells, but reacts with a zirconia-based electrolyte. To prevent this undesirable reaction, a ceria phase has been introduced in between the LNF cathode and electrolyte. On the other hand, the ceria phase itself could react with lanthanum-based perovskite oxides. We examined the reactivity of LNF and $Ce_{0.8}Sm_{0.2}O_{2-\delta}$ (samaria-doped ceria (SDC)) in this study. The mixtures of LNF and SDC were sintered at temperatures between 1123 K and 1623 K and the resultants were analyzed by X-ray diffraction together with the Rietveld analyisis. We also measured the activity of electrochemical cells with a LNF-SDC composite layer in between the LNF cathode and zirconia-based electrolyte. The lattice parameters of each phase are clarified and a possible reaction scheme is proposed. The cell activity was high, but was influenced by the sintering temperature of the composite. Both chemical stability and physical properties of the cathode can affect the cell activity.

Lead-Me Interface for a Pulling Sensation from Hand-held Devices

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

Appl. Percept., ACM Press, Vol. 5, No. 3, pp. 15-1–15-17, 2008.

When a small mass in a hand-held device oscillates along a single axis with asymmetric acceleration (strongly peaked in one direction and diffuse in the other), the holder typically experiences a kinesthetic illusion characterized by the sensation of being continuously pushed or pulled by the device. This effect was investigated because of its potential application to a hand-held, nongrounded, haptic device that can convey a sense of a continuous translational force in one direction, which is a key missing piece in haptic research. A 1 degree-of-freedom (DOF) haptic device based on a crank-slider mechanism was constructed. The device converts the constant rotation of an electric motor into the constrained movement of a small mass with asymmetric acceleration. The frequency that maximizes the perceived movement offered by the haptic device was investigated. Tests using three subjects showed that for the prototype, the best frequencies were 5 and 10 cycles per second.

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K. Fujita and Y. Tsukada

Information Processing Society of Japan Trans., IPSJ, Vol. 49, No. 9, pp. 3165–3179, 2008.

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