External Awards

Awaya Prize Young Researcher Award
Winner: Hiroaki Itou, NTT Cyber Space Laboratories
Date: Sep. 21, 2011
Organization: Acoustical Society of Japan

For "A Study of Acoustic Evanescent Wave Reproduction Using Linear Loudspeaker Array" (in Japanese).

Awaya Prize Young Researcher Award
Winner: Shoichi Koyama, NTT Cyber Space Laboratories
Date: Sep. 21, 2011
Organization: Acoustical Society of Japan

For "Evaluation in Real Environments of Wave Field Synthesis Using Angular Spectrum Differentiation" (in Japanese).

Papers Published in Technical Journals and Conference Proceedings

Design and Implementation of New uTupleSpace Enabling Storage and Retrieval of Large Amount of Schema-less Sensor Data

T. Nakamura, K. Kashiwagi, Y. Arakawa, and M. Nakamura

Proc. of the IEEE/IPSJ 11th International Symposium on Applications and the Internet (SAINT 2011), pp. 414–420, Munich, Germany, 2011.

This paper proposes the design and implementation of a new uTupleSpace to meet increases in the variety and quantity of sensor data. We introduce two extensions to our storage and delivery system for sensor data in order to share a lot of sensor data and enable many applications to utilize them. One stores schema-less sensor data and searches among them. This enables the introduction of various types of applications for a sensor network one after another and the sharing of data stored through such applications. The other creates chunks of sensor data. This method fundamentally improves processing overheads caused by the existence of a huge amount of small sensor data. We implemented the uTupleSpace with the proposed enhancements and experimentally investigated the performance improvement achieved by creating chunks of data.

Large Array of Sub-10-nm Single-Grain Au Nanodots for use in Nanotechnology

N. Clément, G. Patriarche, K. Smaali, F. Vaurette, K. Nishiguchi, D. Troadec, A. Fujiwara, and D. Vuillaume

Small, Wiley-VCH, Vol. 7, No. 18, pp. 2607–2613, 2011.

A uniform array of single-grain Au nanodots, as small as 5–8 nm, can be formed on silicon using e-beam lithography. The as-fabricated nanodots are amorphous, and thermal annealing converts them to pure Au single crystals covered with a thin SiO_2 layer. These findings are based on physical measurements, such as atomic force microscopy (AFM), atomic-resolution scanning transmission electron microscopy, and chemical techniques using energy dispersive X-ray spectroscopy. A self-assembled organic monolayer is grafted onto the nanodots and characterized chemically with nanometric lateral resolution. The extended uniform array of nanodots is used as a new testbed for molecular electronic devices.

Population Relaxation Induced by the Boson Peak Mode Observed in Optical Hyperfine Spectroscopy of $^{167}Er^{3+}$ Ions Doped in a Silicate Glass Fiber

D. Hashimoto and K. Shimizu

J. Opt. Soc. Am. B, Vol. 28, No. 9, pp. 2227–2235, 2011.

We demonstrate transient saturation spectroscopy for $^{167}Er^{3+}$ ions doped in a silicate glass fiber cooled at 2.5–30 K to measure the population relaxation time t_1 of the hyperfine sublevels. The observed t_1 value is 3.1 ms at 4 K and we observe anomalous temperature dependence whereby t_1 becomes rather longer with heating from 4 to 30 K. We can regard the population relaxation as being a result of the Raman scattering of the Boson peak mode (BPM) peculiar to a silicate glass by the 4f-electrons of the $^{167}Er^{3+}$ ions. We can attribute the anomalous temperature dependence to the suppression of the Raman scattering by thermal hopping of the localized BPM.

Usability Evaluation of Pointing Using Self-image from Arbitrary Viewpoint

E. Hosoya, I. Harada, A. Onozawa, and H. Murase

Human Interface, The Transactions of Human Interface Society, Vol. 13, No. 3, pp. 221–233, 2011 (in Japanese).

The pointing operation in video communication with a "shared space" approach is evaluated. The shared space is a constructed image in which a remote image is overlaid with the self-image. It is known that such a manner of communication can promote natural conversation including easy gaze recognition and a feeling of space sharing. However, the performance of the pointing operation in the shared space has not been examined fully. Experiments have been

done to evaluate it with various parameters such as viewing angle and mirroring of the shared space image. As a result of these experiments, guidelines for shared space design using pointing have been created.

CENSREC-4: An Evaluation Framework for Distant-talking Speech Recognition under Reverberant Environments

T. Fukumori, T. Nishiura, M. Nakayama, Y. Denda, N. Kitaoka, T. Yamada, K. Yamamoto, S. Tsuge, M. Fujimoto, T. Takiguchi, C. Miyajima, S. Tamura, T. Ogawa, S. Matsuda, S. Kuroiwa, K. Takeda, and S. Nakamura

Acoust. Sci. & Tech., Vol. 32, No. 5, p. 201–210, 2011.

We have been distributing a new collection of databases and evaluation tools called CENSREC-4, which is a framework for evaluating distant-talking speech in reverberant environments. The data contained in CENSREC-4 are connected-digit utterances as in CENSREC-1. Two subsets are included in the data: "basic data sets" and "extra data sets." The basic data sets are used for evaluating the room-impulse-response-convolved speech data to simulate various reverberations. The extra data sets consist of simulated data and corresponding real recorded data. Evaluation tools are currently provided only for the basic data sets and ones for the extra data sets will be delivered in the future. The task of CENSREC-4 with a basic data set appears simple; however, the results of experiments prove that CENSREC-4 provides a challenging reverberation speech-recognition task, in the sense that a traditional technique to improve recognition and a widely used criterion to represent the difficulty of recognition deliver poor performance. Within this context, this common framework can be an important step toward the future evolution of reverberant speech-recognition methodologies.

Present and Future of Terahertz Communications

H. J. Song and T. Nagatsuma

IEEE Trans. on Terahertz Science and Technology, Vol. 1, No. 1, pp. 256–263, 2011.

Recent changes in how people consume multimedia services are causing an explosive increase in mobile traffic. With more and more people using wireless networks, the demand for ultra-fast wireless communications systems is increasing. To date, this demand has been accommodated with advanced modulation schemes and signal-processing technologies at microwave frequencies. However, without increasing the carrier frequencies to create more spectral resources, it may be difficult to keep up with the needs of users. Although there are several alternative bands, recent advances in terahertz-wave (THz-wave) technologies have attracted attention owing to the huge bandwidth of THz waves and their potential for use in wireless communications. The frequency band of 275–3000 GHz , which has not been allocated for specific uses yet, is especially of interest for future wireless systems with data rates of 10 Gbit/s or higher. Although THz communications is still in a very early stage of development, there have been lots of reports that show its potential. In this review, we examine the current progress of THz-wave technologies related to communications applications and discuss some issues that need to be considered for the future of THz communications.
