External Awards

International Standard Development Award
Winner: Noboru Harada, NTT Media Intelligence Laboratories
Date: April 25, 2019
Organization: Information Technology Standards Commission of Japan (ITSCJ), Information Processing Society of Japan (IPSJ)

For his contribution to the development of international standards on lossless audio coding by the International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC).

Contribution Award for Standardization
Winner: Shinya Shimizu, NTT Media Intelligence Laboratories
Date: May 21, 2019
Organization: ITSCJ, IPSJ

For his contribution to standardization activities in ISO/IEC Joint Technical Committee 1/Subcommittee 29/Working Group 11.

Papers Published in Technical Journals and Conference Proceedings

One-way Transfer of Quantum States via Decoherence
Y. Matsuzaki, V. M. Bastidas, Y. Takeuchi, W. J. Munro, and S. Saito

Proc. of the 20th Anniversary of Superconductiong Qubits, P-61, Tsukuba, Ibaraki, Japan, May 2019.

Quantum state transfer is an important technique in quantum information processing. The standard way to transfer the quantum state is to use a unitary evolution and/or a measurement feedforward operation. A sequential implementation of SWAP gates can transfer the quantum states from the initial site to the target site. Implementations of control-phase gate and subsequent measurement feed-forwards can perform quantum teleportation. Unitary evolution due to the flip-flop interaction induces oscillations of quantum states between sites, and an appropriate turn on/off of the interaction can implement a quantum state transfer. However, such approaches need to switch on/off the interaction between quantum systems with accurate timing, which could induce time jittering error. Here, we propose an alternative way to implement a directional transfer of the quantum state via decoherence from the tailored environment.

Kirari! for Arena: Real-time Remote Reproduction of 4-directional Views with Depth Perception
J. Nagao, H. Miyashita, T. Sano, K. Hasegawa, and T. Isaka

Journal of the Imaging Society of Japan, Vol. 58, No. 3, pp. 306–315, June 2019.

This paper describes the "Kirari! for Arena" system, which is an integral combination of NTT's immersive telepresence technology "Kirari!". This system transports events such as sports and entertainment to remote locations in real time and reproduces the scene in four directions with depth perception. At the capture site, it shoots videos from four directions, scans the positions of objects, performs image extraction and tracking of objects, and transmits the information to the remote locations in real time. At the reproduction site, it transforms the videos to add depth perception and projects them to a special four-sided display device.

Word-based Japanese Typed Dependency Parsing with Grammatical Function Analysis
T. Tanaka and M. Nagata

Journal of Natural Language Processing, Vol. 26, No. 2, pp. 441–481, June 2019.

We present a novel scheme for word-based Japanese typed dependency parsing which integrates syntactic structure analysis and grammatical function analysis such as predicate-argument structure analysis. Compared to bunsetsu-based dependency parsing, which is predominantly used in Japanese NLP, it provides a natural way of extracting syntactic constituents. This makes it possible to jointly decide dependency and predicate-argument structure, which is usually implemented as two separate steps. By using grammatical functions as dependency types, we can obtain the detailed syntactic information from parsing results, while keeping the converted bunsetsu-based dependency accuracy as high as CaboCha, one of the state-of-the-art dependency parsers.

Sound Event Localization and Detection Using FOA Domain Spatial Augmentation
L. Mazzon, M. Yasuda, Y. Koizumi, and N. Harada

The Fifth Edition of the IEEE AASP Challenge on Detection and Classification of Acoustic Scenes and Events (DCASE 2019 Challenge), New York, USA, Mar.–June 2019.

This technical report describes the system used in the DCASE 2019 Task 3: Sound Event Localization and Detection challenge. The

system consists of a convolutional recurrent neural network (CRNN) reinforced by a ResNet structure. A two-stage training strategy with label masking is adopted. The main advancement of the proposed method is a data augmentation method based on rotation in the first order Ambisonics (FOA) domain. The proposed spatial augmentation enables us to augment direction of arrival (DOA) labels without losing physical relationships between steering vectors and observations. Evaluation results of the development dataset show that even though the proposed method did not use any ensemble method in this experiment, (i) the proposed method outperformed a state-of-the-art system published before the submission deadline and (ii) the DOA error has significantly decreased: 2:73° better than the state-of-the-art system.

An Experimental Demonstration of Secure Quantum Sensing

P. Yin, Y. Takeuchi, W. Zhang, Y. Matsuzaki, and G. Chen
Gordon Research Conference, Hong Kong, China, June 2019.

In a previous work, we theoretically proposed a secure delegated quantum sensing protocol. In this presentation, we give results of a proof-of-principle experiment of our delegated quantum sensing protocol. From the experiment, we have confirmed that our protocol is secure.

Quantum Computational Universality of Hypergraph States with Pauli-X and Z Basis Measurements

Y. Takeuchi, T. Morimae, and M. Hayashi

Quantum Information and String Theory 2019, Kyoto, Japan, May/June 2019.

Measurement-based quantum computing is one of the most promising quantum computing models. Although various universal resource states have been proposed so far, it was open whether only two Pauli bases are enough for both universal measurement-based quantum computing and its verification. In this talk, we construct a universal hypergraph state that only requires adaptive Pauli X and Z-basis measurements for universal measurement-based quantum computing. We also show that universal measurement-based quantum computing on our hypergraph state can be verified in polynomial time using only non-adaptive X and Z-basis measurements.

A Pilot Study on Consumer IoT Device Vulnerability Disclosure and Patch Release in Japan and the United States

A. Nakajima, T. Watanabe, E. Shioji, M. Akiyama, and M. Woo

The 14th ACM ASIA Conference on Information, Computer and Communications Security (ACM ASIACCS 2019), Auckland, New Zealand, July 2019.

With our ever-increasing dependence on computers, many governments around the world have started to investigate strengthening the regulations on vulnerabilities and their lifecycle management. Although many previous works have studied this problem space for mainstream software packages and web applications, relatively few have studied this for consumer IoT devices. As a first step towards filling this void, this paper presents a pilot study on the vulnerability disclosures and patch release behaviors related to three prominent consumer IoT vendors in Japan and three in the United States. The goals of this study include (i) characterizing trends and risks using accurate data that spans a long period, and (ii) identifying problems, challenges, and potential approaches for future studies of this problem space. To this end, we collected all published vulnerabilities and their patches for the consumer IoT products by these vendors between 2006 and 2017; then, we analyzed them from multiple perspectives such as the timing of patch releases with respect to disclosures and exploits as well as the severity of the vulnerabilities. Our work has uncovered several important findings that may inform future studies. These findings include (i) a stark contrast in the vulnerability disclosures in the two included countries, (ii) multiple alarming practices by the included vendors that may pose significant risks of 1-day exploits, and (iii) challenges in data collection including crawling automation and long-term data availability. For each of these findings, we also provide discussions on its consequences and/or potential migrations or solutions.