External Awards

Certificate of Appreciation
Winner: Seishi Takamura, NTT Media Intelligence Laboratories
Date: June 12, 2020
Organization: IEEE Region 10 Symposium (TENSYMP2020) Organizing Committee

For his contribution to the quality of the symposium by delivering keynote speech titled "Latest Advances in Video Coding Technology for Immersive Visual Communications."

Excellent Oral Presentation
Winner: Hideaki Kimata, NTT Media Intelligence Laboratories
Date: July 6, 2020
Organization: The 4th International Conference on Graphics and Signal Processing (ICGSP 2020)

For "Hierarchical and Compact Bitmap Based Data Structure of Human Dynamics Data for Visualization."
Published as: H. Kimata, W. Xiaojun, R. Tanida, "Hierarchical and Compact Bitmap Based Data Structure of Human Dynamics Data for Visualization," ICGSP 2020, June 2020 (online).

IEICE Communications Express Top Downloaded Letter Award in June 2020
Winners: Yuki Arikawa, Hiroyuki Uzawa, Takeshi Sakamoto, Satoshi Shigematsu, and Shunji Kimura, NTT Device Innovation Center
Date: July 17, 2020
Organization: The Institute of Electronics, Information and Communication Engineers (IEICE) Communications Express

For "High-speed Radio-resource Scheduler with Hardware Accelerator for Fifth Generation Mobile Communications Systems."
Published as: Y. Arikawa, H. Uzawa, T. Sakamoto, S. Shigematsu, and S. Kimura, "High-speed Radio-resource Scheduler with Hardware Accelerator for Fifth Generation Mobile Communications Systems," IEICE Commun. Exp., Vol. 6, No. 5, pp. 236–241, 2017.

Encouraging Award
Winner: Ryo Igarashi, NTT Access Network Service Systems Laboratories
Date: September 11, 2020
Organization: IEICE Technical Committee on Communication Systems

For "Reach Extension of 10G-EPON Upstream Transmission using Distributed Raman Amplification."
Published as: R. Igarashi, T. Kanai, M. Fujiwara, H. Suzuki, J. Kani, J. Terada, "Reach Extension of 10G-EPON Upstream Transmission using Distributed Raman Amplification," IEICE Tech. Rep., Vol. 119, No. 365, CS2019-94, pp. 33–38, Jan. 2020.

Distinguished Contributions Award
Winner: Miyuki Imada, NTT Service Evolution Laboratories
Date: September 15, 2020
Organization: IEICE Communications Society

For her contribution to the IEICE Communications Society as a secretary of planning, the Council of Technical Committee Representatives.

Papers Published in Technical Journals and Conference Proceedings

Arena-style Immersive Live Experience (ILE) Services and Systems: Highly Realistic Sensations for Everyone in the World
J. Nagao, K. Tanaka, and H. Imanaka
ITU Journal: ICT Discoveries, Vol. 3, No. 1, pp. 33–41, May 2020.

Immersive live experiences (ILEs) enable audiences at remote sites to feel real-time highly realistic sensations, as if they were at the event site. This article discusses the key functionalities of an implementation of ILE services called "Kirari! for Arenas" as a use case of arena-style ILE and its technical elements developed by NTT laboratories. The key functionalities are object extraction from an arbitrary background, object tracking with depth sensors, low-latency synchronized data transport, and four-sided pseudo-3D image presentation with depth expression. This article also provides evaluations on the experience of Kirari! for Arena audiences, as well as its conformance to International Telecommunication Union, Telecommunication Standardization Sector (ITU-T) standards for ILEs.

Quanum Remote Sensing under the Effect of Dephasing
H. Okane, H. Hakoshima, Y. Takeuchi, Y. Seki, and Y. Matsuzaki
arXiv:2007.15903 [quant-ph], August 2020.

Quantum remote sensing (QRS) is a scheme to add security about

the measurement results of a qubit-based sensor. A client delegates a measurement task to a remote server that has a quantum sensor, and eavesdropper (Eve) steals every classical information stored in the server side. By using quantum properties, the QRS provides an asymmetricity about the information gain where the client gets more information about the sensing results than Eve. However, quantum states are fragile against decoherence, and so it is not clear whether such a QRS is practically useful under the effect of realistic noise. Here, we investigate the performance of the QRS with dephasing during the interaction with the target fields. In the QRS, the client and server need to share a Bell pair, and an imperfection of the Bell pair leads to a state preparation error in a systematic way on the server side for the sensing. We consider the effect of both dephasing and state preparation error. The uncertainty of the client side decreases with the square root of the repetition number M for small M, which is the same scaling as the standard quantum metrology. On the other hand, for large M, the state preparation error becomes as relevant as the dephasing, and the uncertainty decreases logarithmically with M. We compare the information gain between the client and Eve. This leads us to obtain the conditions for the asymmetric gain to be maintained even under the effect of dephasing.

Trusted Center Verification Model and Classical Channel Remote State Preparation

T. Morimae and Y. Takeuchi

arXiv:2008.05033 [quant-ph], August 2020.

The classical channel remote state preparation (ccRSP) is an important two-party primitive in quantum cryptography. Alice (classical polynomial-time) and Bob (quantum polynomial-time) exchange polynomial rounds of classical messages, and Bob finally gets random single-qubit states while Alice finally gets classical descriptions of the states. In [T. Morimae, arXiv:2003.10712], an information-theoretically-sound non-interactive protocol for the verification of quantum computing was proposed. The verifier of the protocol is classical, but the trusted center is assumed that sends random single-qubit states to the prover and their classical descriptions to the verifier. If the trusted center can be replaced with a ccRSP protocol while keeping the information-theoretical soundness, an information-theoretically-sound classical verification of quantum computing is possible, which solves the long-standing open problem. In this paper, we show that it is not the case unless bounded-error quantum polynomial time (BQP) is contained in MA (the Merlin–Arthur protocol). We also consider a general verification protocol where the verifier or the trusted center first sends quantum states to the prover, and then the prover and the verifier exchange a constant round of classical messages. We show that the first quantum message transmission cannot be replaced with an (even approximate) ccRSP protocol while keeping the information-theoretical soundness unless BQP is contained in AM (the Arthur–Merlin protocol). We finally study the verification with the computational soundness. We show that if a ccRSP protocol satisfies a certain condition even against any quantum polynomial-time malicious prover, the replacement of the trusted center with the ccRSP protocol realizes a computationally-sound classical verification of quantum computing. The condition is weaker than the verifiability of the ccRSP. At this moment, however, there is no known ccRSP protocol that satisfies the condition. If a simple construction of such a ccRSP protocol is found, the combination of it with the trusted center verification model provides another simpler and modular proof of the Mahadev's result.
