QCIT Meeting - 16th of Feb. 2021

Organized
by
Andrea Conti, Lajos Hanzo, Soon-Xin Ng and Peter Mueller

Agenda

- **9:00 EDT - Welcome by ComSoc President Prof. Vincent Chan**
- **9:10 EDT - Prof. Hausi Mueller: IEEE Quantum Week**
- Approval of Previous Meeting Minutes
- Report on ETC Meeting, ICC'21, GC'21 - Andrea Conti
- Next QCIT-ETC Meeting & Informal Workshop: ICC'2021
- An *Ad Hoc* QCIT Workshop
- Adjourn

Zoom Link for joining:
https://zoom.us/j/96078283835?pwd=S2QzUGFZcmIwNXgweThEeFZULzZJUT09
Meeting ID: 960 7828 3835
Passcode: 849455

Find your local number: https://zoom.us/u/abwjxOBxOW

Selected Topics in Quantum Communications:
An *Ad Hoc* QCIT Workshop - 16th of Feb. 2016

I. 9:30 EDT - Gui-Lu Long

Title: "Transmiting information directly and securely in quantum channels - quantum secure direct communication and its potential applications"

Abstract: Quantum secure direct communication (QSDC) transmits information directly over a quantum channel. Tremendous progress has been made: Detailed security analysis, coding schemes for high loss quantum channel and quantum-memory-free protocols have been developed. A practical QSDC prototype that supports texts, image files and real-time telephone has already been implemented. By combining QSDC with post-quantum cryptographic algorithms, secure-classical-repeater quantum networks can be constructed using present-day technology, which offers secure end-to-end communication, eavesdropping detecting capability, full compatibility with existing network and hence the functionalities provided by modern internet.

Biography: Gui-Lu Long is a professor in quantum information at Tsinghua University & Beijing Academy of Quantum Information Sciences. Notably among his contributions, he proposed the quantum secure direct communication(QSDC) that transmits information directly, in sharp contrast to QKD; constructed Grover-Long algorithm for exact search and the full quantum eigensolver (FQE) for NISQ applications; and established the widely used linear combination unitaries (LCU) method for quantum algorithm designs. He published 300+ papers with 18000+ citations. He is IEEE member, fellow of IoP (UK) and APS (US). He was President of AAPPS, one of three biggest continental physical associations in the world.

II. 10:00 EDT - Andrea Conti

Title: "Quantum discrimination of Noisy Photon-Added Coherent States"

Abstract: Quantum state discrimination (QSD) is a key enabler in quantum sensing and networking, for which we envision the utility of non-coherent quantum states such as photon-added coherent states (PACSs). This talk will first provide a representation of PACSs affected by thermal noise during state preparation in terms of Fock basis and quasi-probability distributions. The effects of phase diffusion and photon loss, due to the interaction with the environment, on QSD performance will be quantified. It will be shown that the use of PACSs, instead of coherent states, can significantly improve the QSD performance.

Biography: Andrea Conti is a Professor and founding director of the Wireless Communication and Localization Networks Laboratory at the University of Ferrara, Italy. His research interests involve theory and experimentation of wireless communication and localization systems. His current research topics include network localization and navigation, distributed sensing, adaptive diversity communications, and quantum information science. He received the HTE Puskas Tivadar Medal, the IEEE Communications Societys Fred W. Ellersick Prize, and the IEEE Communications Societys Stephen O. Rice Prize in the field of Communications Theory. He has been selected as an IEEE Distinguished Lecturer.

III. 10:30 EDT - Dilip Krishnawany

Title: "Quantum Processing for System Optimization in Emerging Networks"

Abstract: Quantum-based systems support the notion of a probabilistic state vector across different state dimensions in a system. Emerging systems will process information in an increasingly distributed manner. For such distributed processing systems, quantum-state vectors can be used to represent the overall distributed state information in the system. The state of the system can then evolve probabilistically based on unitary transforms associated with quantum state variables. The amplitudes associated with quantum states can be progressively refined such that a collapse of the state can result in a optimal solution to a system optimization problem. Such an approach can be utilized for different types of system optimization problems such as SON/PCI optimization in heterogeneous and disaggregated networks, distributed energy

management in networks, load balancing in heterogeneous networks, or network-access coordination across access nodes and devices. This talk will provide a framework to explore such quantum-based processing to help with system optimization in emerging networks.

Biography: Dilip Krishnaswamy received a PhD in electrical engineering from the University of Illinois at Urbana-Champaign. He is an inventor on 60+ granted US patents, and has co-authored 70+ research publications. He has worked at Intel, Qualcomm Research, and IBM Research, and currently serves as a VP for R&D related to emerging technologies at Jio Platforms.