

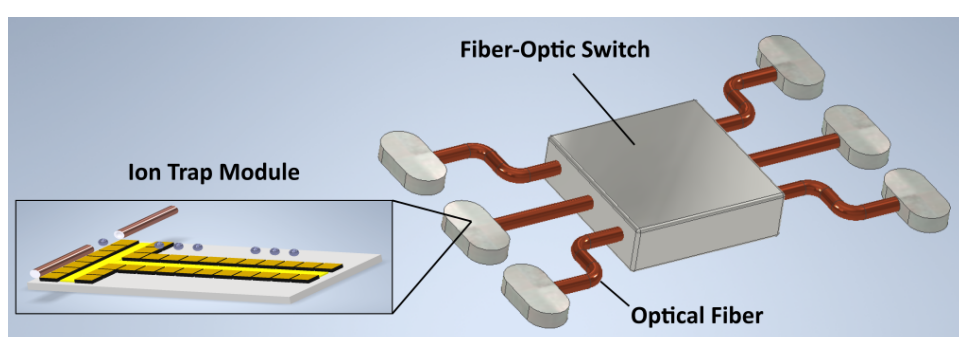
OIST-KEIO SHOWCASE TALK SERIES 2

LECTURE 1

Quantum photonic interconnects for ion trap quantum computers

Hiroki Takahashi, Ph.D OIST

Hiroki got his Ph.D in applied physics at University of Tokyo in 2009. He worked at University of Sussex from 2009 to 2018 as a post-doctoral scholar. He moved back to University of Tokyo in 2018. After a brief spell at Osaka University in 2019, he moved to OIST and started the Experimental Quantum Information Physics (EQulP) Unit in 2020.



The development of quantum computing hardware has seen a rapid progress in recent years up to a point where a quantum computer by Google shows supremacy over classical computers on specially contrived benchmarks. However scaling up quantum computers to a practically useful size is still a daunting task, requiring perhaps decades of further research and development. We pursue a breakthrough in ion trap quantum technologies that enables efficient linkage between independent ion trap quantum computers using photonic interconnects.

In the talk I will overview the basics of quantum computing and trapped ions, and then discuss our approach towards photonically interconnected ion trap quantum computers.

LECTURE 2

Development of Artificial Kidney: Challenges in Medical Engineering

Norihisa Miki, Ph.D KEIO

Norihisa Miki received Ph.D. in mechano-informatics from University of Tokyo in 2001. He developed a world-smallest drone using MEMS technology during his Ph.D. Then, he worked at MIT microengine project as a posdoc (2001-2003), later as a research engineer (2003-2004). He joined the Department of Mechanical Engineering at Keio University in 2004 as an assistant professor and became a full professor in 2017. His research interests started with development of MEMS-based biomedical and human interface devices. Currently, he also explores the fields of medical engineering, neuroscience, and media arts using his innovative devices.

Although hemodialysis treatment is a well-developed treatment, the quality-of-life of the patients is low due to the frequent hospital visits and severe restriction of water and salt intake. Our group has been developing an implantable dialysis system, or artificial kidney for a decade. I will be introducing the most recent results and in addition, the challenges that we have encountered. Medical engineering mandates good collaboration between medical doctors and engineers, i.e., close communication, mutual understanding, and courage to jump out of the comfort zone. Since medical engineering is quite application-oriented, commercialization of the products and, if necessary, founding a company must be envisioned.

