Report on Cirq

Cirq is a Python software library for writing, manipulating, and optimizing quantum circuits, and then running them on quantum computers and quantum simulators. Cirq was developed by the Google AI Quantum Team, and the public alpha was announced at the International Workshop on Quantum Software and Quantum Machine Learning on July 18, 2018. The programs can be executed on local simulators. Quantum programs in Cirq are represented by "Circuit" and "Schedule" where "Circuit" represents a Quantum circuit and "Schedule" represents a Quantum circuit with timing information. Cirq is an open-source framework for noisy intermediate scale quantum (NISQ) computers. Today at the First International Workshop on Quantum Software and Quantum Machine Learning (QSML), the Google AI Quantum team announced the public alpha of Cirq, an open source framework for NISQ computers. Cirq is focused on near-term questions and helping researchers understand whether NISQ quantum computers are capable of solving computational problems of practical importance. Cirq is licensed under Apache 2, and is free to be modified or embedded in any commercial or open source package. Once installed, Cirq enables researchers to write quantum algorithms for specific quantum processors. Cirq gives users fine tuned control over quantum circuits, specifying gate behavior using native gates, placing these gates appropriately on the device, and scheduling the timing of these gates within the constraints of the quantum hardware. Data structures are optimized for writing and compiling these quantum circuits to allow users to get the most out of NISQ architectures.

Cirq supports running these algorithms locally on a simulator, and is designed to easily integrate with future quantum hardware or larger simulators via the cloud. Today, the Google AI Quantum team is using Cirq to create circuits that run on Google's Bristlecone processor. In the future, Google plans to make this processor available in the cloud, and Cirq will be the interface in which users write programs for this processor. In the meantime, they also hope that Cirq will be improving the productivity of NISQ algorithm developers and researchers everywhere.