

Model of a quantum processing device and a quantum programming framework

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Abstract

© SGEM2017. All rights reserved. We propose a model of a programmable quantum processing device realizable with existing nanophotonic technologies and which can be viewed as a basis for new high performance hardware architectures. The physical architecture is formalized by a mathematical model of the Quantum Processing Unit (QPU), which is a hardware-specific modification of the quantum circuit model of computation, and it is universal as well, since the available set of operations provides a universal basis for quantum computations. The proposed model is a basis for the Quantum Programming Framework running over JAVA virtual machine that makes it possible to perform universal quantum computations in a multitasking environment. This framework has two main parts - the dispatcher and the service. The service adapts the high-level user commands to the low level for further implementation. The dispatcher was created to support the different types of connections between the classical computer and the QPU - it can be either a physical device or a QPU emulator.

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Keywords

Decoherence, Quantum computer, Quantum memory, Quantum processing unit, Single-qubit and multi-qubit gates

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