HIGH PERFORMANCE SIMULATION OF QUANTUM CIRCUITS WITH FIELD-PROGRAMMABLE GATE ARRAYS

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In this work, the advantages of incorporating a Field-Programmable Gate Array (FPGA) in a high-performance computing system to accelerate the simulation of quantum circuits was studied. This work analyzes the processes in which such devices are commonly used, concluding that they can be beneficial due to their parallelisation and real-time data control characteristics. The performance of global gates acting on all qubits has been simulated along with an alternative decomposition of the circuits into local gates acting on two neighboring qubits. The performance in time and hardware consumption have led to the conclusion that FPGA resources can be used more efficiently in circuits with local gates or low-entanglement states, which allows for greater parallelisation.

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