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Quantum Algorithm for Search Problems

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Abstract: An algorithm is quantum in the sense that it can run on a quantum computer. Though classical algorithm can run successfully on a quantum computer still they are inferior as compared to quantum algorithms because quantum algorithm uses the concept of superposition or entanglement. Quantum algorithms are commonly described by quantum circuits which is a model of quantum computations and the steps to solve the problems are quantum gates, which performs on one or more qubits. A quantum circuit is concluded with a measurement on one or more qubits. Quantum algorithms have the advantage that they are reversible in nature, where in if measurements are not part of a circuit, a reverse traversal of the quantum circuit will undo the operation brought about the forward traversal of that circuit. The quantum algorithms are considered as most powerful as they can solve some of the complex problems significantly faster than classical algorithm. Quantum algorithms are proven to be superior as compared to classical algorithm, where algorithm complexity is concern. The advantage of quantum algorithm is that they can explore all branches of a non-deterministic algorithm in parallel by the concept of quantum parallelism. To measure the runtime in case of quantum computing quantum circuits are designed with the use of a number of elementary gates each applied to a small number of qubits. Quantum computing has a wide spread application in a number of challenging problems. All these applications are based on quantum algorithms that runs on a quantum computer and achieve a speed up. The areas in which quantum algorithms can be applied includes cryptography, simulations of quantum system, search problem and optimization and solving a large scale of complex linear equations. In this article we mainly focused on an important algorithm known as the Grover's Quantum algorithm with an emphasis on its applications to search problem. We give only the overview of its applications rather than the technical details.

Keywords:

1. Introduction

Quantum computers are not merely faster, smaller version of the conventional computer that we have today. Nor are they the another incremental step in the evolution of