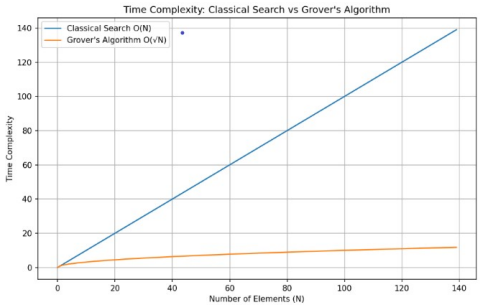
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Masterarbeit

Exploring the Power and Potential of Grover's Algorithm in Quantum Computing

Motivation

The field of quantum computing has seen significant advances in recent years, with Grover's algorithm being one of the most notable developments. This thesis aims to delve into the intricacies of Grover's algorithm, its efficiency, and its potential applications. Grover's algorithm, proposed by Lov Grover in 1996, is a quantum algorithm that searches unsorted databases with a quadratic speedup compared to classical algorithms. The algorithm's efficiency results from its ability to exploit the principles of superposition and interference, fundamental aspects of quantum mechanics.



Problem Statement

The first part of this thesis will provide a comprehensive understanding of the algorithm, including its mathematical formulation and quantum circuit representation.
The second part will focus on the efficiency of the algorithm. It will include a comparative analysis of Grover's algorithm with classical search algorithms, highlighting the speedup achieved by the quantum approach.
The third part of this thesis will focus on the practical implementation of Grover's algorithm on hybrid quantum computing systems. Hybrid quantum computing systems, which combine classical and quantum computing elements, represent a promising avenue for the realization of complex quantum algorithms.
The final part of the thesis will explore potential real-world applications of Grover's algorithm. This includes, but is not limited to, its use in cryptography, database search, and machine learning.

The work can be done in German or English.

Prior knowledge

- Basic understanding of quantum mechanical concepts
- Programming skills (Python)
- Strong interest in and enthusiasm for research

Research area

- Quantum Computing
- Implementation of quantum algorithms
- Comparison of algorithms

Studiengang

- [x] Elektro- und Informationstechnik
- [x] Informatik
- [x] Mathematik
- [x] Physik

Alignment

- [x] Research
- [x] Implementation
- [x] Analysis and evaluation
- [x] Method development

Start

At any time

Links

Mitarbeiterseite

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