SE3

5BHIT 2018/19

Quantum Computing - Fault Tolerance

What limits quantum computing regarding error correction?

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Inhaltsverzeichnis

1 Abstract

Abstract for paper

2 Introduction

Introduction to the subject, why certain problems delay the advancement of quantum computation

2.1 General structure of quantum computing

Paper introducing Quantum Computation and fault tolerance [4]

3 Current physical limitations

Papers focusing on quantum computer architecture [5] [3]

Paper focusing on natural limitations of quantum computing Deeper explanation of problems appearing in a physical context

3.1 Decoherence

Short overview on what quantum decoherence is, why it happens and why prevention is necessary

3.2 Relaxation

Short overview on quantum relaxation and how it affects quantum computing

4 Techonological methods to prevent decoherence

Information about fault tolerance [4]

4.1 Quantum correcting code

Information about quantum error correction [2]

5 Approaches to solutions

Proposing solutions to stated problems

Architectures minimizing errors [5] [3]

6 Future advancements

How possible solutions might be implemented in the future and what might be possible/plausible.

7 Conclusion

Conclusion of paper and possibly answer to proposed question

Estimated hours of work: 12-14h

Literaturverzeichnis

[1] Fayez Fok Al Adeh. „Natural Limitations of Quantum Computing“. In: *International Journal of Swarm Intelligence and Evolutionary Computation* 6.1 (2017), S. 1–7. ISSN: 2090-4908. DOI: 10.4172/2090-4908.1000152. URL: https://www.omicsonline.org/open-access/natural-limitations-of-quantum-computing-2090-4908-1000152.php?aid=87985.

[2] D. Gottesman. „An Introduction to Quantum Error Correction and Fault-Tolerant Quantum Computation“. In: *ArXiv e-prints* (Apr. 2009). arXiv: 0904.2557 [quant-ph].

[3] N. C. Jones u. a. „Layered Architecture for Quantum Computing“. In: *Physical Review X* 2.3, 031007 (Juli 2012), S. 031007. DOI: 10.1103/PhysRevX.2.031007. arXiv: 1010.5022 [quant-ph].

[4] A. Paler und S. J. Devitt. „An introduction to Fault-tolerant Quantum Computing“. In: *ArXiv e-prints* (Aug. 2015). arXiv: 1508.03695 [quant-ph].

[5] R. Van Meter u. a. „Distributed Quantum Computation Architecture Using Semiconductor Nanophotonics“. In: *ArXiv e-prints* (Juni 2009). arXiv: 0906.2686 [quant-ph].