PES UNIVERSITY

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Course: Quantum Entanglement and Quantum Computing

Course code: UE22EC

Project on:

An overview of "Oracle Quantum Algorithms"

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Abstract:

This report is an overview and analysis of various Oracle based quantum algorithms. We will be looking into Deutsch, Deutsch-Jozsa, Bernstein-Vazirani, Simon's and Grover's quantum mechanical algorithms. This paper contains simulation and analysis of the various algorithms.

The simulations are carried out using Python and matlab.

Introduction:

Quantum computing is a field that uses quantum mechanics and algorithms to solve complex problems fast and efficiently. They take advantages of various effects like superposition and entanglement. In reference to [1] the concept of quantum mechanics was first introduced by Yuri Manin in the early 1980's. The idea of quantum machines was first established by Paul Benioff and Richard Feynman where he said that quantum mechanical systems cannot be efficiently on classical systems. Oracle quantum techniques also known as "Black Box". It is a Boolean function or device that outputs 0 or 1 based on inputs. The first quantum algorithm was proposed by David Deutsch in 1985. We will discuss the many moderations and advancements made to the quantum computing algorithms.

Mathematics:

1. Quantum bit

A quantum bit, or qubit, is the basic unit of information in quantum computing. It's the quantum equivalent of the binary bit used in classical computers.

References:

[1] R. Pereira da Silva, "Oracle Quantum Algorithms: An Overview," *SSRN Electronic Journal*, Jun. 2024. [Online]. Available: https://ssrn.com/abstract=4862127. [Accessed: Nov. 22, 2024].

[2] https://www.google.com/search?q=what+is+quantum+computing&rlz=1C1ONGR_en-GBIN1073IN1073&oq=what+is+quantum+computing&gs_lcrp=EgZjaHJvbWUyDAgAEEUYORixAxiABDIHCAEQABiABDIHCAIQABiABDIHCAMQABiABDIHCAQQABiABDIHCAUQABiABDIHCAYQABiABDIHCAcQABiABDIHCAgQABiABDIHCAkQABiABNIBCDg0MzlqMGo3qAIAsAIA&sourceid=chrome&ie=UTF-8

[3] I. G. Karafyllidis, "Quantum computer simulator based on the circuit model of quantum computation," in IEEE Transactions on Circuits and Systems I: Regular Papers, vol. 52, no. 8, pp. 1590-1596, Aug. 2005, doi: 10.1109/TCSI.2005.851999.

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