Quommentaries

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1 Leftoverture

This repository is dedicated to solve exercises and comment on Quantum Computing. Most of the discussion is based on Nielsen And Chuang's book "Quantum Computation and Quantum Information". In addition, Kaye, Laflamme and Mosca's "An Introduction to Quantum Computing" is used as a complementary book, as well as Yanofsky and Mannucci's "Quantum Computing for Computer Scientists" - recommended by Greati.

1.1 Objective

Although Nielsen and Chuang's book is very famous, some equations may be solved too quickly. This may discourage the reader to continue the studies if the basic concepts were not mastered. One of the objectives of this repository is to support those who are studying Quantum Computing and Quantum Information by explaining some of these equations step-by-step.

In addition, the exercises present in the book may not be trivial for beginners. Hence, this repository attempts to help the students by showing a detailed solution or, at least, a sketch.

1.2 Disclaimer

This repository is being constructed by an **undergaduate student**. Henceforth, the notes, commentaries and exercises are **suscetible to errors**. Please, **do not hesitate to give feedback** (gustavowl@lcc.ufrn.br).

2 Introduction

On August 19, 2018, the author was studying the *Section 2.5 - The Schmidt decomposition and purification* of Nielsen and Chuang's book. Up until this section, all exercises were fairly discussed in worked problem's website. Most of the answers are reasonably satisfactory, though some lack formalism and detailed explanation. However, this website only discusses exercises 2.1 to 2.76. Question 2.77 is discussed on StackExchange's website. Apparently, question 2.78 onward are not commonly discussed. Henceforth, this material will *initially* focus on these questions. Details on questions 2.1 to 2.76 will be added sporadically.

In addition, this material will contain details on the equations solved during each chapter. Most explanations will try to specify the steps using to jump from one equation to another. Also, some affirmations and equations may induce doubts in the author; who will try to state and clarify them in this document.

3 Nielsen and Chuang - Chapter 01

3.1 Section 1.2

3.1.1 Qubit representation in a Bloch Sphere

The explanation to the following formula is not given by the book.

$$|\psi\rangle = e^{i\gamma}(cos\frac{\theta}{2}|0\rangle + e^{i\varphi}sin\frac{\theta}{2}|1\rangle)$$

However, Agnez came up with a simple explanation using spherical coordinates. Its details can be found at TODO: add link to Computer Society

3.2 Section 1.4

3.2.1 Deutsch's Algorithm

Add notes from step $|\psi_1\rangle$ to step $|\psi_2\rangle$ of the circuit.