1819-108-C3-W8-SecondExam

Andrejs Komisarovs

March 2019

suffer from the cumulative build-up of noise, as opposed to digital standards like transistor–transistor logic that latch to their high or low levels through constant measurement and feedback. Quantum bits are similarly vulnerable to analogue noise, but they can offer much more in return, providing massively parallel information processing.

Thus, properties of quantum information make it look advantageous for computation. Computers process information and computation is a kind of information processing. Thus, quantum computation involves quantum information.

The main idea of quantum computing, which is attributed to Feynman (1982; 1986) and Beniof (1980; 1982), is to perform computation on the level of atoms and subatomic particles, utilizing a theoretical ability to manufacture, manipulate, and measure quantum states of physical systems. As there are different quantum process and various models are used in quantum physics, several approaches to quantum computation have been developed: a quantum Turing machine (Deutsch, 1985), quantum circuits (Feynman, 1986; Deutsch, 1989), modular functors that represent topological quantum computation (Freedman, 2001; Freedman, et al, 2002), and quantum adiabatic computation (Farhi, et al, 2000; Kieu, 2002; 2003).

According to the standard quantum mechanics approach, quantum computers run on quantum information in much the same way as a classical computer runs on classical information (cf., for example, (Deutsch, 1985)). The elementary storage units are two-state quantum systems or qubits instead of classical bits. Quantum computing units perform unitary transformations on a few (typically, one or two) qubits. Programs (or algorithms) for quantum computers are then sequences of such operations. In order to read the result of a quantum computation, one has to perform a measurement. Like all quantum measurements, it does not always give the same value, but results in a statistical distribution. However, for a good quantum algorithm, the probability of obtaining the correct result is significantly larger than what is possible to get by chance. Just as for classical stochastic algorithms this is then sufficient to reach any desired degree of certainty by repetitions of the computation.

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\documentclass[12pt]{extarticle}
\usepackage[utf8x]{inputenc}
\usepackage{fancyhdr}
\usepackage{amsmath,amssymb}
\usepackage{graphicx}
\usepackage{incgraph,tikz}
\usepackage{tikz,lipsum,lmodern}
\usepackage[most]{tcolorbox}
\usepackage[pass,paperwidth=174mm,paperheight=247mm,left=50mm,
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\usepackage[bottom]{footmisc}

\title{1819-108-C3-W8-SecondExam}
\author{Andrejs Komisarovs}
\date{March 2019}

\pagestyle{fancy}
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\begin{document}

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