



# New Optimization algorithm via Modified Quantum Genetic Computation

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## Abstract

This paper proposes a modified method for solving optimization problems by quantum genetic algorithms. This method according to mutation after measurement process, improves the efficiency and accuracy of searching the optimal solution of the optimization problem. To show the advantages of proposed method an example simulation is presented.

**Keywords:** Quantum Genetic Algorithm, Mutation, Qubit

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## 1 Introduction

Quantum genetic algorithm (QGA) is the product of the combination of quantum computation and genetic algorithms, and it is a new evolutionary algorithm of probability [2]. It was proposed by Narayanan and Moore in 1996. QGA is based on the concept and principles of quantum computing such as qubits and superposition of states. The quantum state vector is introduced in the Genetic Algorithm to express genetic code, and quantum logic gates are used to realize the chromosome evolution [3]. By these means, better results are achieved, but there are still some problems in conventional QGA. In this paper we improve the performance of QGA by mutation of chromosomes before rotating the Genes. This paper is organized as follows. In section 2 a description of the basic concept of quantum computing and QGA principles is presented. Section 3 describes the structure of QGA. An experimental simulation and Concluding remarks follow in Section 4.

## 2 QGA principles

### 2.1 Qubit and Its Representation

In quantum information theory, the state  $|\psi\rangle$  of a (finite dimensional) quantum system encodes information. In particular, in typical implementations, the information is encoded in a number of two level systems called qubits [1]. The qubit is a two-state quantum system. These two states of a qubit are represented by the computational basis vectors

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