Duality quantum computer and the efficient quantum simulations
SHIJIE WEI, GUILU LONG, Tsinghua Univ, TSINGHUA NATIONAL LABORATORY FOR INFORMATION SCIENCE AND TECHNOLOGY COLLABORATION, COLLABORATIVE INNOVATION CENTER OF QUANTUM MATTER COLLABORATION — Duality quantum computer is a new kind of quantum computer which is able to perform an arbitrary sum of unitaries, and therefore a general quantum operator. This gives more computational power than a normal quantum computer. All linear bounded operators can be realized in a duality quantum computer, and unitary operators are just the extreme points of the set of generalized quantum gates. Duality quantum computer can provide flexibility and clear physical picture in designing quantum algorithms, serving as a useful bridge between quantum and classical algorithms. In this report, we will firstly briefly review the theory of duality quantum computer. Then we will introduce the application of duality quantum computer in Hamiltonian simulation. We will show that duality quantum computer can simulate quantum systems more efficiently than ordinary quantum computer by providing descriptions of the recent efficient quantum simulation algorithms.

Shijie Wei
Tsinghua Univ

Date submitted: 17 Dec 2015

Electronic form version 1.4