

# 要 旨

## 可逆演算にもとづく量子電卓シミュレータ

吉村 涼太

量子計算は超並列処理という新たな可能性から近年話題となっている．現在の量子計算はショアやグローバーのアルゴリズムのような特殊なアルゴリズムの研究が盛んに行われているのに対し，最も簡単でユニバーサルな演算である加算や減算のアルゴリズムについてはあまり研究がない．そこで，本研究では量子ビットの加算回路を設計し，その回路に可逆性をもった回路を作用させることで量子加減算回路を設計した．量子加減算回路をもとに量子電卓シミュレータを作成し，シミュレータでの実験結果から量子計算の可能性を示した．

キーワード 量子ビット，量子論理ゲート，可逆演算

# Abstract

## Quantum calculator simulator based on reversible operation

Ryota Yoshimura

Quantum computation is the novel computational scheme that has attracted recent attention because of its potential for massive parallelism. Another hallmark of quantum computation is its reversibility which helps expand the computational toolbox. As opposed to such popular subject of investigation as Shor's and Grover's algorithms, which are powerful but specialized, there has been very few research on the subject of elementary algebra of addition, which is the most basic and universal algorithm. In this work, we theoretically design the reversible quantum circuit that is capable of adding and subtracting two  $N$  qubits. Based on this design, we construct a quantum calculation simulator on conventional computer, and examine the power and possibility of quantum computation.

*key words*    Quantum bits , Quantum logic gate , Reversible operation