硕士中期报告-软件测试

高丁超

Institute of Software Chinese Academy of Sciences

December 22, 2023

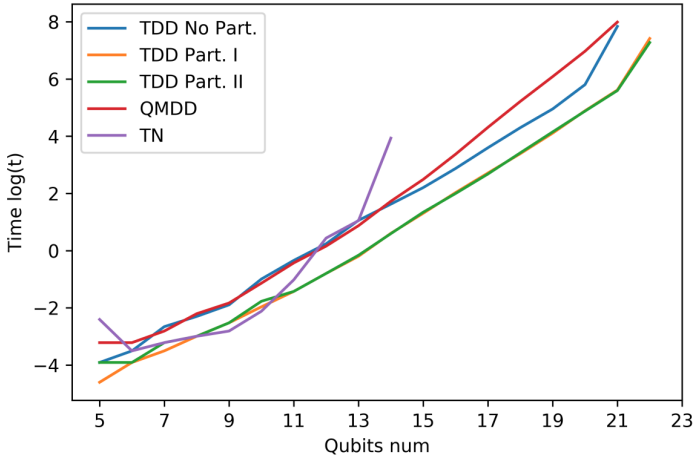
背景介绍

transition system: (S, I, Σ, T)

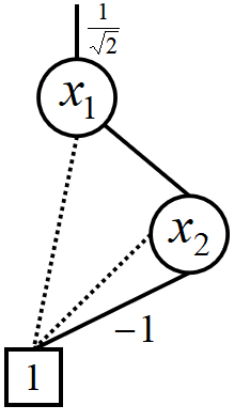
$$where \begin{cases} x = x_1, \cdots, x_n \\ y = y_1, \cdots, y_n \\ \sigma = \sigma_1, \cdots, \sigma_m \end{cases}$$

Quantum transition system: (S, S_0, Σ, R)

前期调研


TDD No Part.
TDD Part. I
TDD Part. II
QMDD
TN
Time log(t)
Qubits num
8
6
4
2
0
−2
−4
5
7
9
11
13
15
17
19
21
23

基本功能



$$=$$

$$\begin{array}{c} \\ x_1 = 0 \\ x_1 = 1 \end{array} \begin{array}{c} \begin{array}{cc} x_2 = 0 & x_2 = 1 \end{array} \\ \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix} \end{array}$$

模块功能

输入处理模块

内存管理模块

TDD 基础模块

TDD 算法模块

Python 实现

依赖项

- Python >= 3.9.0
- Numpy >= 1.20.0
- Qiskit >= 0.25.0
- Graphviz >= 0.20.0

测试硬件：**Intel Xeon-Gold-5215 CPU and 512GB RAM**

测试样例

benchmark	basic	addition	contraction
Grover 20	$\sim$5min	$\sim$4min	$\sim$4sec
Quantum Fourier Transform 20	$\sim$20min	$\sim$11min	$<$1sec
Quantum Random walk 20	$\sim$6min	$\sim$4min	$\sim$15sec
Bernstein-Vazirani 50	$\sim$4min	$\sim$4min	$\sim$16sec
GHZ 500	$\sim$3sec	$\sim$1.5sec	$\sim$1.7sec

C++ 实现

依赖项

- C++ Standard 17
- CMake >= 3.20.0
- XTL >= 0.7.5
- XTENSOR >= 0.24.0
- Graphviz >= 2.43.0
- XTENSOR-Python >= 0.26.0
- Pybind11 >= 2.12.0
- Numpy >= 1.20.0

测试硬件：**WSL**

测试样例