Jul 15, 2022

Efficient realization of quantum primitives for Shor's algorithm using PennyLane library

Anatoly Antipov[1], Evgeniy Kiktenko[1,2,3], Aleksey Fedorov[4]

[1]RQC; [2]MIPT; [3]SMI of RAS; [4]RQC, MISIS

dx.doi.org/10.17504/protocols.io.b5qaq5se

Anatoly Antipov
RQC

ABSTRACT

The following protocol describes how to use a software package containing implementations of various quantum gates and well-known quantum algorithms using PennyLane library. Templates within the package include all required elements from the quantum part of Shor's algorithm, specifically, efficient modular exponentiation and quantum Fourier transform that can be realized for an arbitrary number of qubits specified by a user.

DOI

dx.doi.org/10.17504/protocols.io.b5qaq5se

EXTERNAL LINK

https://doi.org/10.1371/journal.pone.0271462

PROTOCOL CITATION

Anatoly Antipov, Evgeniy Kiktenko, Aleksey Fedorov 2022. Efficient realization of quantum primitives for Shor's algorithm using PennyLane library. **protocols.io** https://dx.doi.org/10.17504/protocols.io.b5qaq5se

FUNDERS ACKNOWLEDGEMENT

RSF grant
Grant ID: 19-71-10091

MANUSCRIPT CITATION please remember to cite the following publication along with this protocol

Antipov AV, Kiktenko EO, Fedorov AK (2022) Efficient realization of quantum primitives for Shor's algorithm using PennyLane library. PLoS ONE 17(7): e0271462. doi: 10.1371/journal.pone.0271462

KEYWORDS

Quantum computing, Shor's algorithm, modular exponentiation, quantum Fourier transform, quantum arithmetics

CREATED

Feb 28, 2022

LAST MODIFIED

Jul 15, 2022

PROTOCOL INTEGER ID

58850

1 First of all, you should install the PennyLane library using the regular python environment and set up the Jupyter Notebook's environment

2 Content of the Github repository should be uploaded on your PC via the following link:

https://github.com/Anatoly-Antipov/QuantumOperations

Files with the extension ".py" represent original python code that realizes the software package with new useful functions built upon the PennyLane library. Functions from this software package are ready-to-use commands similar to PennyLane's functions and commands.

Files with the extension ".ipynb" are Jupyter Notebooks that contain examples of the use of commands from the software package.

See the README.md file in the repository to view an up-to-date description of included files

3 Use the file "Example.ipynb" or the file "ExampleOrderFinding.ipynb" to get the simplest example of the use of a new function. The file "Test.ipynb" contains the full list of newly introduced functions alongside the demonstration of its use in a Jupyter Notebook's environment.

Citation: Anatoly Antipov, Evgeniy Kiktenko, Aleksey Fedorov Efficient realization of quantum primitives for Shor's algorithm using PennyLane library https://dx.doi.org/10.17504/protocols.io.b5qaq5se