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Upload a cover letter as a separate file in the online system. The length limit is 1 page.

The cover letter should include the following information:

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Plos One

July, 2023

To whom it may concern:

I am writing to submit our research article entitled “Quantum simulation of

Pauli channels and dynamical maps: algorithm and implementation” to be

considered for publication as a research article in PLOS One.

In this article, we focus on one of the fundamental purposes of quantum

computers since their inception: simulating quantum systems. Specifically, we

propose and simulate on a quantum computer an algorithm for implementing

Pauli channels. These channels are transformations of qubit systems typically

arising from noise affecting quantum devices (Flammia S. and Wallman J.,

Efficient estimation of Pauli channels, 2020). Pauli channels are examples of

the evolution of open quantum systems, which have garnered interest due to

their applications in the study of entanglement (Farías O.J. et al,

Observation of the emergence of multipartite entanglement between a bipartite

system and its environment, 2012) and dissipative processes

(Barreiro J. et al, An open-system quantum simulator with trapped ions, 2011).

Moreover, we extend the algorithm to encompass Pauli channels dependent on a

parameter, which we refer to as Pauli dynamical maps. This extension leads us

to investigate quantum algorithms with parameter-dependent operations, known as

parametrized quantum circuits. In this manuscript, we establish the

mathematical conditions necessary for implementing any parametrized operation

using a quantum circuit using only one parametrized single qubit operation. We

believe these findings will be of interest to readers of your esteemed journal.

All relevant data and codes to replicate the results can be found in the following public repository <https://github.com/tbasile/Quantum-simulation-of-Pauli-Channels.git> .

We declare the manuscript’s originality and exclusivity for publication. In

addition, we have not had any prior interactions with PLOS regarding this

manuscript. In the event that our manuscript is chosen for review, we kindly

suggest Dr. Fabio Sciarrino as a suitable reviewer, given his background and

expertise to evaluate our findings. We have no objections to any other

potential reviewers.

Each named author has significantly contributed to the research and preparation

of this manuscript. The authors have declared that no competing interests exist.

Both authors received support from projects CONAHCyT (Consejo Nacional de Humanidades, Ciencias y Tecnologías https://dgapa.unam.mx/index.php/impulso-a-la-investigacion/papiit) 285754, and UNAM-PAPIIT (Universidad Nacional Autónoma de México - Programa de Apoyo a Proyectos de Investigación e Innovación Tecnológica https://conahcyt.mx/) IG101421. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Thank you for considering our work.

On behalf of all authors,