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Balik Scientist Program
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Quantum Computing Innovation Laboratory

Duration: 2022-2024

Host Institution: DOST - Advanced Science and Technology Institute (ASTI)

Project Description

Aims to establish a research and development laboratory wherein researchers from within and outside DOST-ASTI can collaborate on developing quantumenabled solutions to key problems in the industry.

General Objective: To provide local researchers with a cloud-based service that local researchers from the academe and industry can use for simulating quantum processes.
Specific Objectives:
1. To capacitate the DOST-ASTI's COARE HPC facility with the hardware and FOSS array-based quantum circuit simulator software libraries LIQUi|>, IQS, and ProjectQ.
2. To analyze the software design of and underlying methods used in the JKQ-DD FOSS decision diagram-based quantum circuit simulation software library for identifying parallelization and distributed computation strategies for improving its execution both in the desktop and HPC environment.
3. To conduct benchmarking activities of the LIQUi|>, IQS, ProjectQ, JKQ-DD, and modified JKQ-DD software libraries for quantum circuit simulation of universal quantum computation in COARE (on CPU cores; qubit count will vary for each library depending on the memory capacity and core count of the HPC) using entanglement benchmark, random circuits benchmark, and quantum algorithms benchmark (QFT, Shor's algorithm, Grover's algorithm) datasets.
4. To conduct Information, Education, and Communication (IEC) activities for partner researchers on how to use the COARE facility and the available quantum circuit simulators for their own research.

Experts Needed

- Quantum circuit simulation Experts (decision diagrams, tensor networks, matrix-vector state representation)

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