Embedding Quantum Simulator

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— We introduce the concept of embedding quantum simulator, a paradigm allowing efficient computation of dynamical quantities requiring full quantum tomography in a standard quantum simulator (one-to-one quantum simulator). The concept consists in the suitable encoding of a simulated quantum dynamics in the enlarged Hilbert space of an embedding quantum simulator. In this manner, non-trivial quantities are mapped onto physical observables, overcoming the necessity of full tomography, and reducing drastically the experimental requirements. As examples, we discuss how to evaluate entanglement monotones and time correlation functions, each in a suitable embedding quantum simulator. Finally, we expect that the proposed embedding framework paves the way for a general theory of enhanced one-to-one quantum simulators.

1This work is supported by Spanish MINECO FIS2012-36673-C03-02; UPV/EHU UFI 11/55; UPV/EHU PhD fellowship; Basque Government IT472-10; SOLID, CC-QED, PROMISCE, SCALEQIT EU projects; and Marco Polo PUCP grant