

Abstract

Creating qubits that are resilient to errors is a necessary step in creating quantum computers. A very promising way of accomplishing this is to encode qubits into the large Hilbert space of quantum harmonic oscillators. This idea leads to a whole class of Quantum Error Correcting codes (QEC codes) called bosonic codes. Many popular codes exist but this work but the work here presented mainly focuses on GKP (Gottesman-Kitaev-Preskill) codes. When developing such codes, it is essential to be able to know how they perform under different noise models. However, the useful large Hilbert space harmonic oscillators here becomes a problem as system with even just a few oscillators rapidly become very challenging to simulate. Here, we propose a combination of different methods that would enable *fast* simulation of large bosonic systems. Namely, we discuss the uses of tensors networks, the selection of a simulation (the BP+ basis), and the use Monte-Carlo simulation (MC). We also present a few preliminary simulation results using these techniques.