Working Title: Block Encoding the Renormalized Quartic Oscillator Hamiltonian

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Abstract

I. INTRODUCTION

A. The Quartic Oscillator Model

II. RENORMALIZATION

The quartic oscillator is a model that is not studied here within the context of quantum field theories; however, we can utilize techniques from these theories to reduce the resources needed to simulate this model. In quantum field theories, Renormalization is the process of removing infinities that arise when doing calculations beyond leading order. Here, Gaussian elimination is performed to systematically remove one row and column from the "infinitely" large Hamiltonian, thus reducing the dimension of the matrix. This is done approximately, since pure Gaussian elimination isn't any cheaper than diagonalizing the infinite matrix.

Guassian elimination starts by writing down the eigenvalue equation for the largest energy eigenvalue of the Hamiltonian.

A. Renormalized Hamiltonian

III. SIMULATION OF RENORMALIZED HAMILTONIAN VIA LOBE

A. Overview of LOBE

IV. CONCLUSION