Computational Study of Quantum Coupled Chaotic Systems

Project Report

Submitted in partial fulfillment of the requirements of
PHY F376 Design Project

By

Aditya Vijaykumar
ID No. 2013B5A4688P

Under the supervision of:

Dr. Jayendra Nath Bandyopadhyay

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE PILANI, PILANI CAMPUS
December 2016

Acknowledgements

Foremost thanks for this project goes to Dr. Jayendra Nath Bandyopadhyay, who offered his guiding hand throughout to make this wonderful project easier and, more importantly, fun. Working on projects alone can turn out to be quite tough at times, and hence sincere thanks are in order for Vishnu Sharma, for being the wonderful discussions partner that he was.

Contents

Chapter 1

Introduction

1.1 Classical Kicked Rotor

In the classical picture, we can write the Hamiltonian of single kicked top as

$$H = \frac{J^2}{2I} + \sum_n V\delta(t - nT) \tag{1.1}$$

where J is the angular momentum of the top, I is the moment of inertia, and V is the kicked potential.

If we try to construct a system having two kicked tops coupled to each other, the corresponding Hamiltonian of the system can be written as

$$H = \frac{{J_1}^2}{2I_1} + \frac{{J_2}^2}{2I_2} + \sum_n (V_1 + V_2 + V_{12})\delta(t - nT) \tag{1.2}$$

where V_{12} is an interaction potential tha couples the dynamics of the system.

1.2 Quantum Kicked Rotor

In the quantum, we replace the angular momentum J's by $\widetilde{hfak}$

Bibliography

[1] Kris Kendall and Chad McMillan. "Practical malware analysis". In: *Black Hat Conference, USA*. 2007, p. 10.

[2] Kyle O'Meara et al. "Malware Capability Development Patterns Respond To Defenses: Two Case Studies". In: (2016).