



Amendment

The Hong Kong University of Science and Technology

Department of Mathematics

MPhil THESIS EXAMINATION

An Operator-Splitting Fast Huygens Sweeping Method for Schrodinger Equations with Electromagnetic Fields

By

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ABSTRACT

In this thesis, we present an operator splitting method for Schrodinger equations in the presence of electromagnetic field in the semi-classical regime. With the operator splitting technique, the time evolution of the Schrodinger equation is divided into two parts: the original Schrodinger equation and the convection step. The original Schrodinger equation can be handled by the Fast Huygens Sweeping Method(FHSM). For the convection step, we propose a semi-Lagrangian method. We show that this method performs better than the idea of the simple extension of the original FHSM. We also show that the convergence rate is nearly one because of the first order splitting error. We implement this method numerically for one dimensional, two dimensional and three dimensional cases. We also found that this method can be applied to a time-dependent vector potential.

Date : **05 Aug 2019, Monday**
Time : **2:00 p.m.**
Venue : **Room 2463 (near lifts 25-26)**
Thesis : **Prof. Yang XIANG (Chairman)**
Examination : **Prof. Shing Yu LEUNG (Supervisor)**
Committee : **Prof. Hai ZHANG**

(Open to all faculty and students)

The student's thesis is now being displayed on the reception counter in the General Administration Office (Room 3461).