شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

MONA MAGHRABY

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MONA MAGHRABY

MULTILEVEL MONTE CARLO METHODS FOR SOLUTION OF STOCHASTIC DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS

By

Eng. Shady Ahmed Nagy

A thesis submitted to the
Faculty of Engineering at Cairo University
In partial Fullfilment of the
Requirements for the degree of
Master of science
In
Engineering Mathematics

FACULTY OF ENGINEERING, CAIRO UNIVERSTY
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Title of Thesis:

Multilevel Monte Carlo methods for solution of stochastic differential equation and its applications.

Key Words:
Stochastic differential equations; Stochastic processes; Numerical analysis; Multilevel Monte Carlo; Low discrepancy sequences.

Summary:
Monte Carlo simulation is wide using in solving stochastic differential equations. Stochastic random samples represent by different random points in Monte Carlo random generation. The development of Multilevel Monte Carlo (MLMC) introduced by Giles to simulate different stochastic differential equations on different time grids by low cost and high convergence rate, also it minimizes the variance. We simulate and compare different type of stochastic differential equations on MLMC depending on Quasi-Monte Carlo of Halton sequence. We apply MLMC in diffrent types of ordinary SDEs as additive and multiplicative one to enhance cost by changing the random sample to be generated by different quasi-random numbers. Also, we use a different type of quasi-random numbers by Component by Component (CBC) algorithm that generates different random numbers by the concept of lattice rule. When we apply it in stochastic Burgers’ equations, theinstability appears in simulation by doesn’t achieve the decreasing in cost despite the minimum time of CBC numbers that generate the stochastic samples.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute. I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

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