Colloquium

Fast computation of the semiclassical Schrödinger equation

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Abstract

Equations of quantum mechanics in the semiclassical regime present an enduring challenge for numerical analysts, because their solution is highly oscillatory and evolves on two scales. Standard computational approaches to the semiclassical Schrödinger equation do not allow for long time integration as required, for example, in quantum control of atoms by lasers. This has motivated our approach of asymptotic splittings. Combining techniques from Lie-algebra theory and numerical algebra, we present a new computational paradigm of symmetric Zassenhaus splittings, which lends itself to a very precise discretisation in long time intervals, at very little cost. We will illustrate our talk by examples of quantum phenomena – quantum tunnelling and quantum scattering – and their computation and, time allowing, discuss an extension of this methodology to time-dependent semiclassical systems using Magnus expansions.

Date:　　12 December 2017 (Tuesday)
Time:　　3:30pm ~ 4:30pm
Venue:　Room 222, Lady Shaw Building,
　　　　　The Chinese University of Hong Kong, Shatin

All are Welcome