Abstract

The objective of this thesis is the development of a new Green's function Monte Carlo algorithm for the heat equation subject to Neumann and mixed boundary conditions. Traditionally, the Green's function Monte Carlo method has been considered computationally inefficient for Neumann and mixed boundary condition problems. This is due to the fact that in traditional approaches, Neumann and mixed boundary conditions are posed as "partially reflecting" and are considered exorbitant in terms of computational resources. Over the last few years, a philosophically different approach has been proposed by my thesis supervisor Dr. Kausik Chatterjee. This approach utilizes novel Green's functions that mimic the boundary conditions of the problems of interest. As a result, all kinds of boundaries - Dirichlet, Neumann and mixed, are posed as absorbing boundaries. This approach has been adapted by Dr. Chatterjee and his co-workers in developing new GFMC algorithms for the Laplace's, Helmholtz and the modified Helmholtz equations. In this thesis, I have extended this approach to the numerical solution of the heat equation, which is the first application of this approach to the solution of a time-dependent equation. The application area of our interest is the thermal analysis of IC chips.