

Abstract

In this thesis we obtain discrete approximations to spatially one-dimensional time-fractional diffusion processes with drift towards the origin by generalizing Ehrenfest's urn model. These discrete approximations can be interpreted (a) as difference schemes for the relevant time-fractional partial differential equation, (b) as random walk models. The relevant convergence questions as well as the behaviour for time tending to infinity are discussed, and results of numerical case studies are displayed for different types of drifts. We interpret the continuous time random walk of the space-time fractional diffusion processes with and without central linear drift. To give a comprehensive point of view about these models we discuss the convergence of the discrete solutions to the corresponding solution of the partial differential equations in the Fourier-Laplace domain.