Nonlinear Sciences > Chaotic Dynamics

Computer Simulation Study of the Levy Flight Process

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Random walk simulation of the Levy flight shows a linear relation between the mean square displacement <r2> and time. We have analyzed different aspects of this linearity. It is shown that the restriction of jump length to a maximum value (lm) affects the diffusion coefficient, even though it remains constant for lm greater than 1464. So, this factor has no effect on the linearity. In addition, it is shown that the number of samples does not affect the results. We have demonstrated that the relation between the mean square displacement and time remains linear in a continuous space, while continuous variables just reduce the diffusion coefficient. The results are also implied that the movement of a levy flight particle is similar to the case the particle moves in each time step with an average length of jumping <l>. Finally, it is shown that the non-linear relation of the Levy flight will be satisfied if we use time average instead of ensemble average. The difference between time average and ensemble average results points that the Levy distribution may be a non-ergodic distribution.

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