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LÉVY WALK AS A MODEL FOR SPATIAL BEHAVIOR OF FORAGING ANIMALS. SELECTED PROPERTIES.

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ABSTRACT

A Lévy walk model was proposed by Klafter, Blumen and Shlesinger 30 years ago [2]. It was introduced within the Continous-Time Random Walk framework as an useful tool in description of various anomalous diffusion processes that are characterized by nonlinear growth of their second moment in time. Since that it has found application in several fields including biological systems (spatial collective behavior of bacteria, humans, bumblebees, seabirds, marine predators, to name only few), statistical physics (cold atoms, blinking quantum dots) and random searches, for other examples see recent comprehensive review: [3].

In this work [1] we present a mathematical model for two generalizations of Lévy walk. Both scenarios can be used in the microscopic description of the spatial behavior of particles. Next we investigate several mathematical aspects of proposed models such as a scaling limits (macroscopic picture), self-similarity and the link to the corresponding fractional diffusion equations that includes fractional material derivative. Finally we propose a simulation scheme that can be used by practitioners in solving numerical issues. In the talk we will also present the newest results. Namely, we will shortly describe the problem of finding closed-form formulas for LW densities and further extensions of the basic model and their properties.

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