

Collective motion and avalanche behavior in animal groups

M. Carmen Miguel¹, Javier Cristin¹, Romualdo Pastor-Satorras²

¹ Department of Condensed Matter Physics, Universitat de Barcelona, Carrer de Marti i Franques 1, Barcelona, Spain

² Department of Physics, Universitat Politecnica de Catalunya, Campus Nord B4, 08034 Barcelona, Spain

Swarming, schooling or flocking are visually dramatic examples of collective animal behavior, all of them distinguished by the emergence of some property such as group cohesion or preferred movement direction. In this work we analyze animal collective motion with the basis of the Vicsek model. Individuals are considered as a set of self-propelled particles in a two dimensional space that interact among them with a local alignment rule. We first obtain a solution of a mean-field approach to the Vicsek model in which its characteristic phase transition is destroyed, and we propose a few modifications to enrich the model. We introduce a limited angle of vision, i.e., a more realistic area of interaction in order to reflect animal sensing and the presence of most common social structures as hierarchical leadership and familiar relationships. Furthermore, we provide evidence of avalanche processes characterizing the rearrangements of the system after a perturbation, and we find the system shows a scale-free avalanche behavior.

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