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Flocking Transition in a Self-propelled Particle Model Using Experimental Motility Conditions JELANI LYLES, PAUL YANKA, North Carolina AT State University, DANIEL SUSSMAN, Emory University, LISA MANNING, Syracuse University, CHIH KUAN TUNG, North Carolina AT State University — Flocking transition has been studied using self-propelled particle models for decades. In these models, the initial angular distribution is random, the step-by-step angular fluctuation is either a bounded flat noise or a Gaussian noise, and the magnitude of the velocity of each moving particle is thought to be a constant. Experimental study of sperm flocking show that an aligned initial condition promotes sperm to form large flocks, angular fluctuation follows an exponential decay, and the velocity distribution follows a Gamma distribution. Our research has focused on using a computational model to understand the effects from those differences between experimental observation and the traditional model conditions. We found that aligned initial condition does help sperm to form larger flocks when the system is at the transition, but not much effect elsewhere. No major difference was seen between exponential and Gaussian angular noise. The Gamma velocity distribution was found to lower the density of the flocks. Our results provide evidence to rethink adapting the conclusion from active matter models to experimental systems.

Jelani Lyles
North Carolina A
T State University

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