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Self-Organized Dynamic Flocking Behavior from a Simple Deterministic Map WESLEY KRUEGER, Brigham Young University — Coherent motion exhibiting large-scale order, such as flocking, swarming, and schooling behavior in animals, can arise from simple rules applied to an initial random array of self-driven particles. We present a completely deterministic dynamic map that exhibits emergent, collective, complex motion for a group of particles. Each individual particle is driven with a constant speed in two dimensions adopting the average direction of a fixed set of non-spatially related partners. In addition, the particle changes direction by π as it reaches a circular boundary. The dynamical patterns arising from these rules range from simple circular-type convective motion to highly sophisticated, complex, collective behavior which can be easily interpreted as flocking, schooling, or swarming depending on the chosen parameters. We present the results as a series of short movies and we also explore possible order parameters and correlation functions capable of quantifying the resulting coherence.

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