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Jian-Guo Liu* (jliu@math.umd.edu), Dept of Physics, Duke University, Durham, NC 27708. *A simple proof of Cucker-Smale flocking dynamics and the mean field limit.*

Flocking, a universal phenomenon, has found applications in many areas ranging from herding to the emergence of common languages in primitive societies. Flocking refers to autonomous agents reaching a consensus based on limited environmental information and simple rules with or without a hierarchical leadership. Last year, Felipe Cucker and Steve Smale postulated a model for flocking of birds and showed convergence to consensus (the same velocity) exponentially.

In this talk, I will show a simple proof of the flocking behavior for the Cucker-Smale system based on a construction of Lyapunov function. A simple phase plane analysis provides a unified condition on the initial states in which the convergence to consensus will occur. For large agent systems and their mean field limit, we give a uniform bound on the velocity field. This enable us to show the stability in Wasserstein-1 distance

(Kantorovich-Rubinstein distance), hence the convergence of large agent systems to the unique measure valued solution of a Vlasov type equation (mean field limit). (Received February 08, 2009)