Asymptotic consensus in the Hegselmann-Krause model with finite speed of information propagation

Jan Haskovec
King Abdullah University of Science and Technology
jan.haskovec@kaust.edu.sa

We introduce a variant of the Hegselmann-Krause model of consensus formation where information between agents propagates with a finite speed $\mathfrak{c} > 0$. This leads to a system of ordinary differential equations (ODE) with state-dependent delay. Observing that the classical well-posedness theory for ODE systems does not apply, we provide a proof of global existence and uniqueness of solutions of the model. We prove that asymptotic consensus is always reached in the spatially one-dimensional setting of the model, as long as agents travel slower than $\mathfrak{c}$. We also provide sufficient conditions for asymptotic consensus in the spatially multi-dimensional setting. Finally, we discuss the mean-field limit of the model, showing that it does not facilitate a description in terms of a Fokker-Planck equation.