The Formation of Swarms as a Consensus Problem

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Swarm formation means that birds (or other „agents") approach by selforganization asymptotically the same velocity whereby distances among them do converge. The main result of the talk offers conditions on the local interaction of the birds for swarm formation to happen. Roughly speaking, the structure of interaction should not be „too loose" and the intensity of interaction should not decay „too fast". Furthermore, the various flight regimes, as for example echelons, occuring in swarm formation will be investigated.
The results presented in the talk apply not only to swarms of birds but also more general to selforganization in multi – agent systems when agents approach asymptotically some consensus. Such systems have found interest in various disciplines ranging from sociology over biology to electrical engineering and computer science. The analysis given in the talk uses tools from Chapter 8 of my book „Positive Dynamical Systems in Discrete Time. Theory,Models,and Applications" (De Gruyter, 2015).