Understanding behavioral patterns: Why bird flocks move in unison

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Animal flocks, be it honeybees, fish, ants or birds, often move in surprising synchronicity and seemingly make unanimous decisions at a moment's notice, a phenomenon which has remained puzzling to many researchers.

New research published today, Wednesday 15 September, in New Journal of Physics, uses a particle model to explain the collective decision making process of flocks of birds landing on foraging flights.

Using a simple self-propelled particle (SPP) system, which sees the birds represented by particles with such parameters as position and velocity, the researchers from Budapest, Hungary, find that the collective switching from the flying to the landing state overrides the individual

landing intentions of each bird.

In the absence of a decision making leader, the collective shift to land is heavily influenced by perturbations the individual birds are subject to, such as the birds' flying position within the flock. This can be compared to an avalanche of piled up sand, which would occur even for perfectly symmetric and cautiously placed grains, but in reality happens much sooner because of increasing, non-linear fluctuations.

As the researchers explain, "Our main motivation was to better understand something which is puzzling and out there in nature, especially in cases involving the
stopping or starting of a collective behavioural pattern in a group of people or animals.

"We propose a simple model for a system whose members have the tendency to follow the others both in space and in their state of mind concerning a decision about stopping an activity. This is a very general model, which can be applied to similar situations."

Possible applications include collectively flying, unmanned aerial vehicles, initiating a desired motion pattern in crowds or groups of animals and even finance, where the results could be used to interpret collective effects on selling or buying shares on the stock market.

More information:
iopscience.iop.org/1367-2630/12/9/093019/fulltext

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