

DOER – Flocking

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Description

Many animals display synchronised behaviour where large swarms will work together to achieve some goal. Examples include bird flocks and fish shoals, fireflies blinking in sync, ants forming roads etc.

How they achieve this without a unifying leader using only relatively simple instructions at the individual level is of great interest for multiple purposes, such as ecology as well as synchronising and automating drone swarms. For space missions for example singular independent crafts are vulnerable to random failures and strikes from micrometeorites incentivising the use of a swarm of crafts that can work together.

This project will revolve around simulating this behaviour using epydemic, a Python library and collecting data based on this simulation. Added complexity such as predator attacks can then be added to this simulation.

There are also limitations in real life to consider when simulating such as drones being unable to fly vertically above or below each other due to downdraft.

Objectives**Primary Objectives:**

- Creating a simulator for flocking behaviour with a range of settings to allow programming individuals and extracting results from the simulation, starting with a simple 3D space such as birds or fish.
- Visualising the swarm.
- Simulate disruptions to the swarm, such as predator attacks.
- Simulate potential physical limitations such as downdraft, limited field of view, inability to occupy the same space etc.

Secondary Objectives:

- Simulate swarms on land with more limited directions to move and which would require a more complex simulation including terrain.
- Simulate an automated drone swarm that must maintain cohesion whilst carrying out some task.
- Simulate further interactions.

Ethics

No ethical issues, the self-assessment form has been completed.

Resources

No resources beyond standard lab computers.

Risks

No particular risks.