AN INTRODUCTION TO THE MATHEMATICS OF COLLECTIVE MOTION

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The Mathematics of Collective Motion is largely concerned with studying what is known as 'emergent dynamics.' In short, emergent dynamics occur when local interactions lead to a global phenomenon. There are many naturally occurring examples of collective motion in biology and physics; from flocks of birds and schools of fish, to swarms of bacteria and synchronization of oscillators; as well as many applications available in technology and social sciences. The approaches to understanding collective phenomena are as varied as the potential applications. In this short course we will introduce some important systems of differential equations that model collective behavior and observe their respective dynamics.

Prerequisites: None

Total Hours: 4

Table of Contents:

References

[1] Roman Shvydkoy. Dynamics and analysis of alignment models of collective behavior. Nečas Center Series. Birkhäuser/Springer, Cham, 2021.
[2] Steven H. Strogatz. From Kuramoto to Crawford: exploring the onset of synchronization in populations of. coupled oscillators. Physica D 143 (2000) 1-20.