

Bulletin of the American Physical Society

APS March Meeting 2021

Volume 66, Number 1

Monday–Friday, March 15–19, 2021; Virtual; Time Zone: Central Daylight Time, USA

Session C15: Physics Education at All Stages

3:00 PM–5:36 PM, Monday, March 15, 2021

Sponsoring Unit: FED

Chair: Catherine Crouch, Swarthmore College

Abstract: C15.00006 : Promoting active matter field through a Vicsek model-based simulation and an online teaching module

4:00 PM–4:12 PM Live

← Abstract →

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Active matter is differentiated from conventional passive matter due to its unique capability of locally consuming fuels to generate kinetic energy. Such a unique feature of active matter has led to unprecedented phenomena and associated applications. While active matter has been developed for decades, its significance is not recognized by the public. To remedy this gap, we developed an online teaching module introducing collective dynamics of active matter, targeting high school and undergraduate students. The collective dynamics were illustrated via the Vicsek model-based simulation because it reveals the collective dynamics of active matter with one simple rule: nearest-neighbor alignment. With this rule, the simulation demonstrated the collective motion of active matter particles depended on particle number, radius of neighbor aligning, and noise that disturbed alignment. To allow students to hands-on experience the simulation, we developed a graphical user interface, allowing users to perform the Vicsek simulation without a programming background. The simulation and teaching module are available on an online platform: The Partnership for Integration of Computation into Undergraduate Physics, allowing teachers in the US to bring the active matter lecture to their classrooms.

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