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Basic real-time simulation using NetLogo

The Flocking Alternative Visualization Model is an adaptation of the standard flocking simulation, which explores the dynamics of how individuals within a group move in synchronized patterns without central authority. This model is based on three basic rules proposed by Craig Reynolds in 1986: separation, alignment, and cohesion. These rules govern the behavior of agents (often depicted as birds, fish, or other entities) to simulate natural flocking behaviors.

Separation requires each agent to avoid crowding its neighbors, maintaining a minimum distance to prevent collision. Alignment compels agents to steer towards the average heading of their local flockmates, promoting a unified group direction. Cohesion draws agents towards the average position of nearby flockmates, ensuring the group stays together. The Flocking Alternative Visualization Model enhances these rules by incorporating additional elements like obstacle avoidance, goal-oriented behaviors, or varying the influence of each rule based on the context or environment.

This model diverges from the classic view by providing visual representations that are not just limited to graphical simulations but can include statistical graphs, heat maps, or even three-dimensional representations. These alternative visualizations help in understanding not just the position and movement of the agents but also the density, speed, and directionality of the flock over time. They can also highlight how changes in parameters affect the overall behavior of the system, providing deeper insights into the dynamics at play.

For instance, heat maps can show areas of high and low agent density, offering clues about how agents interact with the environment and each other. Three-dimensional models can introduce a vertical dimension to movement, applicable in simulations of birds or drones, which operate in airspace.

In summary, the Flocking Alternative Visualization Model extends the conventional flocking model by enhancing interaction rules and integrating diverse visualization tools, broadening the model's applicability and offering richer analytical perspectives. This evolution not only deepens our understanding of collective behaviors but also expands the potential for practical applications in various scientific and engineering fields.

Citations

Toner, J., & Tu, Y. - "Flocks, herds, and schools: A quantitative theory of flocking" (1998)

- Like the Helbing and Molnar paper, this can also be accessed via the American Physical Society's journal archive.
- URL: American Physical Society (APS)

Couzin, I. D., Krause, J., Franks, N. R., & Levin, S. A. - "Effective leadership and decision-making in animal groups on the move" (2005)

- Published in "Nature," this article can be accessed through Nature's official website or through academic databases that your institution may subscribe to.
- URL: Nature