SCAI Report

Observations of 10 boids:

In the simulation with 10 boids, we saw that the boids acted together in a group. They moved smoothly in the same direction, creating a neat flock. Because there were fewer boids, they didn't spread out as much, so they didn't bump into each other often. The boids still moved in a coordinated way, keeping their speeds similar and working together.

Observations of 100 boids:

Increasing the boid count to 100 made the flocking more complex. The boids still stuck together well, forming a tight group. Now, separation played a bigger role because there were more boids, and they interacted more often. Alignment still mattered, and the flock showed a more detailed and dynamic pattern in its behavior.

Observations and comparison of Separation & Cohesion, with 100 boids :

Watching how Separation and Cohesion worked together with 100 boids, you could see that both played a big role in how the group moved. Cohesion kept the boids together, making them act like a team. Meanwhile, Separation became more noticeable because there were more boids, and they tried to avoid each other, giving space. This mix of forces made the flock move in a lively way, staying together but also avoiding getting too crowded or bumping into each other. It made the whole group look interesting and move smoothly.

Observations and comparison of Separation & Alignment, with 100 boids:

Observing Separation and Alignment with 100 boids revealed their distinct impacts on the flock's behavior. The Separation factor became more evident as the increased number of boids emphasized efforts to maintain individual space and avoid collisions. In contrast, Alignment continued to contribute to the overall coordination of the flock, aligning their velocities. This interplay resulted in a dynamic motion, where the group demonstrated both individual spacing and synchronized movement. The absence of a strong cohesion factor allowed for more freedom in individual movements, creating a visually intricate pattern within the larger flock.

Observations and comparison of Cohesion & Alignment, with 100 boids :

Observing Cohesion and Alignment with 100 boids highlighted their distinct influences on the flock's behavior. Cohesion maintained a sense of unity among the boids, encouraging them to move together as a cohesive swarm. On the other hand, Alignment contributed to the synchronized motion of the group by aligning their velocities. The combination of Cohesion and Alignment resulted in a balanced and harmonious flocking pattern. The boids moved collectively, staying connected through cohesion while also aligning their velocities to create a visually appealing and coordinated motion within the larger group.

Explanation and expectation of your modifications :

The modifications: introduced to the flocking model aim to enhance the understanding of swarm behavior. The inclusion of obstacle avoidance adds a new dimension to the decision-making process, allowing boids to navigate around obstacles in their environment. By adjusting the weights of cohesion, separation, and alignment forces, the goal is to observe how these adjustments impact the overall flocking dynamics. Additionally, the exploration of swarm behavior is extended by introducing an obstacle, influencing the boids' movements and interactions.

Expectations: include observing boids actively avoiding obstacles while maintaining cohesive behavior. Adjusting force weights might lead to variations in the flock's patterns, with some configurations emphasizing separation, cohesion, or alignment. The modified model is anticipated to exhibit more nuanced and adaptive behaviors, providing insights into how different factors influence swarm dynamics. Overall, the modifications aim to create a more realistic and versatile simulation of collective animal behavior.

Observations and comparison of your modifications:

Upon implementing the modifications to the flocking model, several observations and comparisons were made to understand the impact on swarm behavior.

Obstacle Avoidance: The introduction of obstacle avoidance successfully influenced the boids' movements. Boids were observed actively altering their paths to avoid obstacles, demonstrating a responsive and adaptive behavior. This addition contributed to a more realistic simulation, mimicking the avoidance behavior observed in real-life animal flocks.

Adjusted Force Weights: By manipulating the weights of cohesion, separation, and alignment forces, distinct variations in flocking dynamics were observed. When cohesion was emphasized, boids tended to move closely together, creating a tightly knit swarm. Emphasizing separation led to boids actively avoiding each other, resulting in a more scattered formation. Increased alignment weight contributed to a synchronized motion, aligning the velocities of neighboring boids.

Combination of Modifications: The combination of obstacle avoidance and adjusted force weights resulted in a more sophisticated and dynamic simulation. Boids not only avoided each other but also navigated around obstacles while maintaining cohesive and aligned behavior. The modifications collectively enhanced the realism and versatility of the model, allowing for a richer exploration of swarm dynamics.