

A flock of colorful birds, represented by small triangles in various colors (blue, green, yellow, orange, red, purple, pink), is flying towards the right side of the frame. The birds are scattered across the background, with a higher density on the left side. The title text is overlaid on the birds.

# FINAL PROJECT: BOIDS

CSCI x810 Computer Graphics Final Project

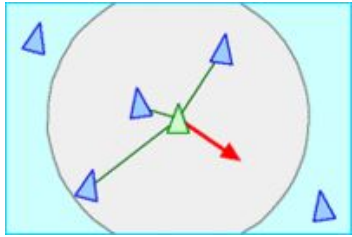
Jorin Thacker

# What is a Boid?

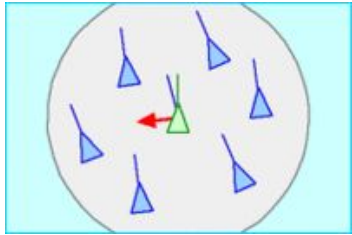
- Boid – A simulated bird like “bird-oid”
- Elaboration of a particle system simulation
- Each Boid is simulated independently
- Creates a “computer model of coordinated animal motion such as bird flocks and fish schools” – Reynolds



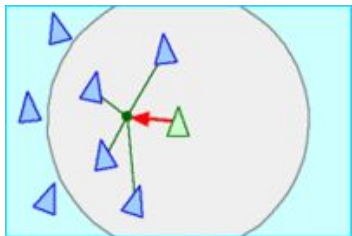
# What makes a Boid work



Separation



Alignment



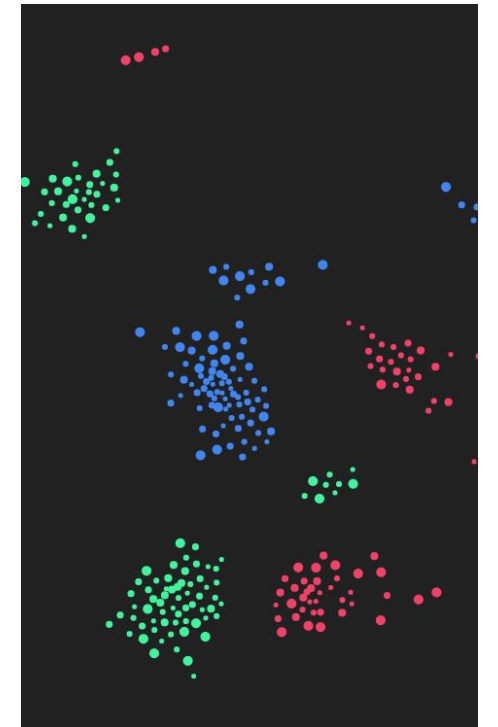
Cohesion

## 3 Main rules

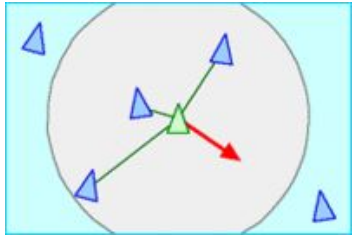
- Separation – steer to avoid flock mates
- Alignment – steer to avg. direction of flock mates
- Cohesion – steer to center of flock mates

## Additional Rules

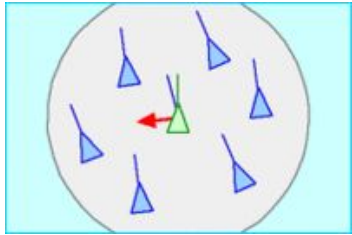
- Collision Avoidance – steer to avoid obstacles
- Bias – gravitate towards their type
- Leadership – follow the Boid in front of it



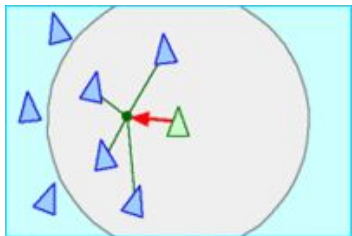
# What makes a Boid work



Separation



Alignment



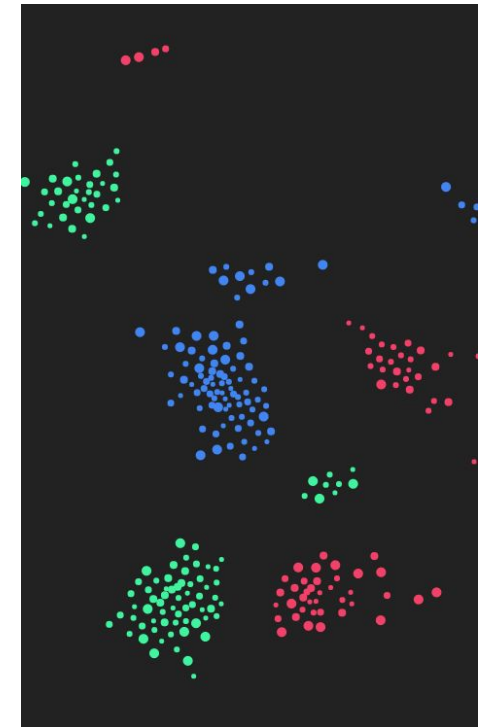
Cohesion

## 3 Main rules

- Separation – steer to avoid flock mates
- Alignment – steer to avg. direction of flock mates
- Cohesion – steer to center of flock mates

## Additional Rules

- Collision Avoidance – steer to avoid obstacles
- Bias – gravitate towards their type
- Leadership – follow the Boid in front of it





# Milestone 1 (Complete)



Project Setup

A horizontal progress bar with a blue fill and rounded ends, indicating 100% completion. It is connected to a thin blue line that extends to the right edge of the slide.



Custom Shaders

A horizontal progress bar with a dark blue fill and rounded ends, indicating 100% completion. It is connected to a thin blue line that extends to the right edge of the slide.



Simple Boid Logic (Movement, Rotation)

A horizontal progress bar with a grey-blue fill and rounded ends, indicating 100% completion. It is connected to a thin grey-blue line that extends to the right edge of the slide.



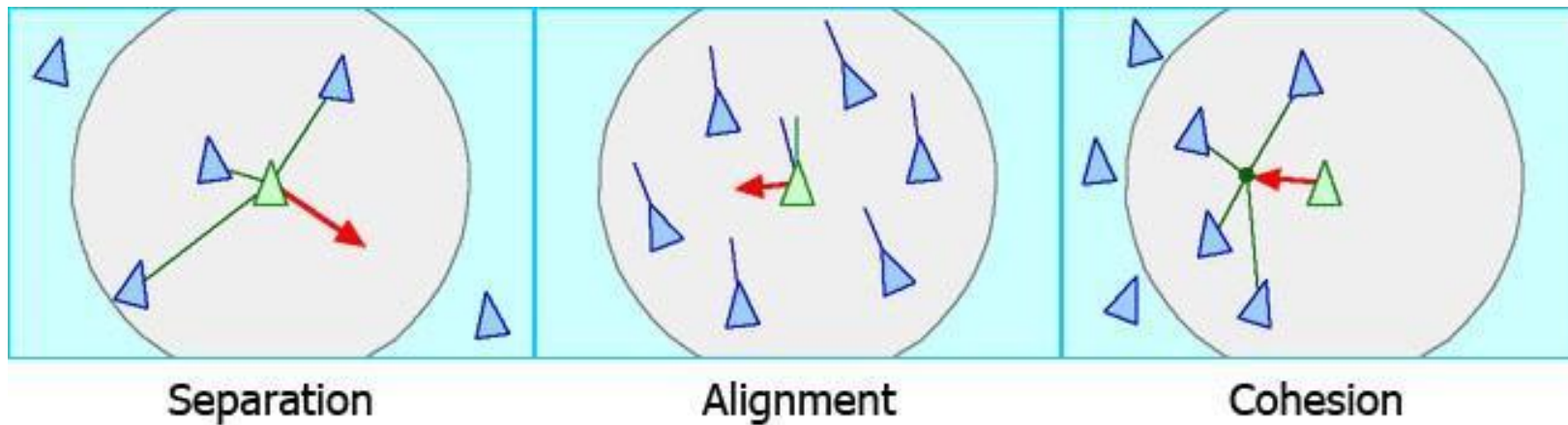
Wall Boundaries

A horizontal progress bar with a teal fill and rounded ends, indicating 100% completion. It is connected to a thin teal line that extends to the right edge of the slide.



# Milestone 2 (Complete)

- Implement Boid Rules (Separation, Alignment, Cohesion)
- Add collision detection for boids (Walls, Objects)
- Create Boid Playground with many objects to navigate (cubes, Spheres, Torus, etc.)



# Milestone 3 (Complete)

Add controls to change aspects of Boids

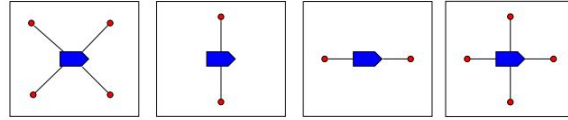
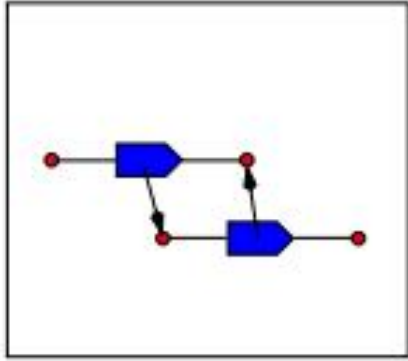
Add additional Rules (Leadership, Swarms/Racism, etc.)

Use a better Model for the boids



# PROJECT DEMO





# Future Work

- Add compute shader (for telling which boids are near each other)
- Implement a more animalistic flock formation (V-formation, torus, diamond, etc.)
- Add other formation options for the type of flock the boids will follow (fish, ants, locusts, etc.)



# Sources

- Starling Flock Video - [https://www.youtube.com/watch?v=V4f\\_1\\_r8oRY](https://www.youtube.com/watch?v=V4f_1_r8oRY)
- Wikipedia page - <https://en.wikipedia.org/wiki/Boids>
- Original paper by Craig Reynolds:  
<https://www.red3d.com/cwr/papers/1987/boids.html>
- Youtuber that introduced me to boids:  
<https://www.youtube.com/watch?v=bqtqltqcQhw>
- Animalistic flocks: <https://www.wired.com/2013/03/powers-of-swarms/>
- Formation techniques: <https://cobweb.cs.uga.edu/~maria/papers/icra-2000.pdf>
- Implementation Design: <https://jumpoffboids.netlify.app/>