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Boids System - School of Fish

Motivation - I recently came across a clip of a scene from Finding Nemo on YouTube. It was the scene that showcases the school of fish creating arrows, and other interesting shapes from the placement of their own bodies.

Link of the scene:
https://www.youtube.com/watch?v=Le13by2WM70&list=RDLe13by2WM70&start_radio=1

That got me thinking, what if I could recreate that in Unity, like a Boids system of the fish?

Methodology - So I decided to start by simply researching what a Boids system is and how schools of fish move together. I noticed the fish act separately on their own until it is time to move to another location, due to external factors, such as a predator, or environmental factors.

I then went into Unity and started.

First I just made a basic cube, and added movement to it along the x-axis. I then added a bunch of cubes and gave them the same movement.

Then I wrote a script to allow them to move in and out of each other's vicinity, while keeping the whole group moving in the same direction.

Then I wrote a script to align themselves closely after the cube got close together.

Since the cubes kept crossing into each other, I wrote and added another script to create an opposite magnetic force when the cubes get too close, similar to how identical end of a magnets repel each other.

And since the cubes kept flying off the screen forever, I added a limit to the range of their movement.

Finally, since I didn't want to create 100 cubes in the hierarchy, I wrote one final script for the Boids system to spawn 100 cubes in random locations.

I then tried to figure out how to cause the fish to create interesting shapes from the link, but I believe that I would have to store all the patterns I want to make in some sort of data structures and basically hard-code their movements, which I didn't end up doing since Boids System has to have a little randomness to it.

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Here is a video that showcases the Boids system of a school of fish. I added some free assets to make the cubes fish and added two sharks to convey the motivation of the fish grouping up and escaping. The sharks have basic movement along the x-axis:

https://www.youtube.com/watch?v=gFVAYvyEqGI