Fish Boid Project

Nature of Code SW

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CONTENTS

[1. CONTENT 3](#_Toc210083494)

[1.1 Steering force 3](#_Toc210083495)

[1.2 Seeking 3](#_Toc210083496)

[1.3 Wandering 4](#_Toc210083497)

[1.4 Stay within walls 4](#_Toc210083498)

[1.5 Flocking 4](#_Toc210083499)

# CONTENT

## Steering force

In late 1980s, Craig Reynolds developed algorithmic steering behaviours for animated characters. These behaviours provide elements to navigate an environment in a life-like manner, of which I will be using includes seeking (fleeing and pursuing), wandering, etc. also includes interaction with other characters and the environment including wall avoidance and flocking.

A steering force is a character with a current velocity seeking a target. I need to ask a vehicle to make intelligent decisions about steering towards its target based on its current state and environment. Steering force = desired velocity – current velocity. The length of desired velocity = max speed.

A diagram of a vehicle steering

AI-generated content may be incorrect.

## Seeking

Acts to steer a character towards a specified target. This is different to an attractive force like gravity but is a vector in the direction of a target. If a character continues to seek it will eventually reach and pass the target before spinning back towards it. There are 2 methods derived from the seek function including pursue and evade.

Pursuit is like seek but it pre-emptively moves towards a predicted position. It assumes the target doesn’t turn in the predicted interval which is 1/30th of a second. So, pursuit is the seek function applied to the predicted position.

Evade is simply the opposite of seek and within my program will be calling seek multiplied by -1 within a specified distance.

A diagram of a situation

AI-generated content may be incorrect.

## Wandering

Wandering is a random steering algorithm that maintains a steering direction making small displacements each frame. This simulates a random walk from one direction to another and is maintained in a wander strength sphere slightly ahead of the character.

A drawing of a line and a triangle

AI-generated content may be incorrect.

## Stay within walls

A white rectangular frame with black border

AI-generated content may be incorrect.This is found primarily in the nature of code rather than Craig Reynolds paper. It just creates a steering force directing the character away from a boundary with a stronger steering force the closer it gets.

## Flocking

The flocking behaviours include a combination of separation, cohesion and alignment. They determine how characters react to other surrounding characters within a defined distance or its perceptual view.

Separation determines a distance from other nearby characters. Each character computes a repulsive force which is summed together producing an overall steering force.

Cohesion computes the average position of nearby characters and coheres it with a group centre of gravity.

Alignment gives the character the ability to align itself with nearby characters averaging the velocity for aligning the steering of all the characters.

A circular object with arrows and arrows

AI-generated content may be incorrect.A drawing of arrows pointing to a circle

AI-generated content may be incorrect.

A clock with arrows pointing at the same time

AI-generated content may be incorrect.

**References**

1. Red3d.com. (2025). *Steering Behaviors For Autonomous Characters*. [online] Available at: https://red3d.com/cwr/steer/gdc99/ [Accessed 01 Jul. 2025].
2. ‌natureofcode.com. (n.d.). *5. Autonomous Agents*. [online] Available at: https://natureofcode.com/autonomous-agents/ [Accessed 01 Jul. 2025].

**DOCUMENT HISTORY**

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| 1.0 | 01/07/25 | Nature of code spike work document. | Jacob Broomfield |