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Boids

Reference

Panel:
Particle System ▸ Physics

Type:
Boids

TODO

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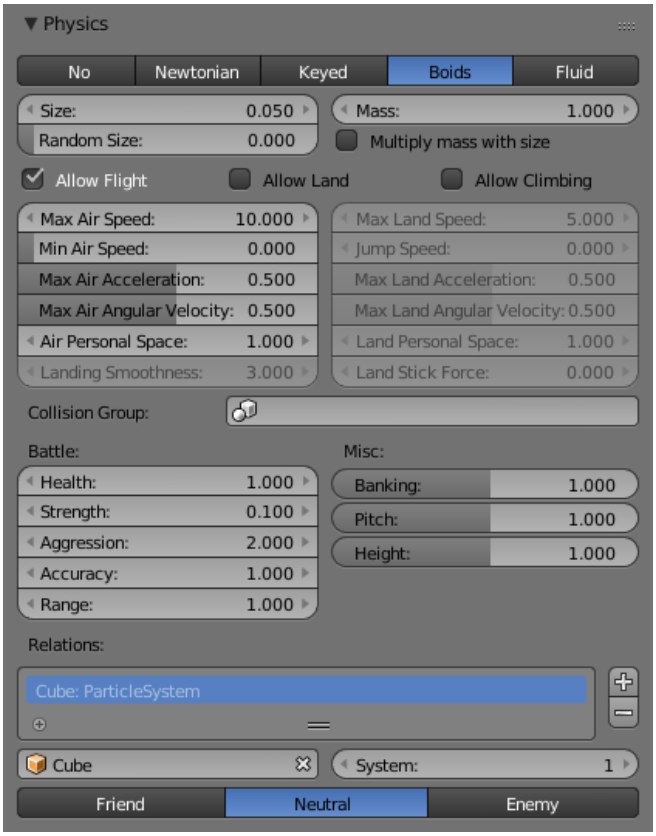

Boid Physics settings.

Boids particle systems are controlled by a limited artificial intelligence, which can be programmed to follow basic rules and behaviors. They are ideal for simulating flocks, swarms, herds and schools of various kind of animals, insects and fishes or predators vs. preys simulations. They can react on the presence of other objects and on the members of their own system. Boids can handle only a certain amount of information, therefore the sequence of the *Boid Brain* rules is very important. In certain situations only the first three parameter are evaluated.

Movement

Reference

Panel:
Particle System ▸ Physics ▸ Movement

Boids avoid objects with Collision enabled, move toward goals, and flee from "predators" based on the *Boid Brain*. Their behavior changes depending whether they are in the air or on land.

Allow Flight
Enables movement in the air.

Allow Land

Enables movement on land.

Allow Climbing

Enables climbing toward goal objects.

Max Air Speed

The maximum velocity boids can achieve while in the air.

Min Air Speed

The minimum velocity boids maintain while flying.

Max Air Acceleration

Controls how quickly boids can change direction in the air, expressed as a percentage of their maximum velocity. Higher values result in more agile movements.

Max Air Angular Velocity

Limits how sharply boids can turn in the air, expressed as a percentage of 180 degrees. Lower values create smoother curves during flight.

Air Personal Space

The radius of personal space for boids in the air, as a percentage of their particle size. Larger values reduce crowding in swarms.

Landing Smoothness

Adjusts how softly boids land on surfaces. Higher values ensure gradual transitions when landing.

Max Land Speed

The maximum velocity boids can achieve on land.

Jump Speed

The velocity boids achieve during jumps.

Max Land Acceleration

Controls how quickly boids can change direction on land, expressed as a percentage of their maximum velocity.

Max Land Angular Velocity

Limits how sharply boids can turn on land, expressed as a percentage of 180 degrees. Lower values create smoother, less abrupt turns.

Land Personal Space

The radius of personal space for boids on land, as a percentage of their particle size. Larger values reduce crowding in herds or groups.

Land Stick Force

Determines the strength of a force required to influence boids on land. Use lower values to allow boids to move more freely when interacting with forces.

Collision Collection

Restricts collisions to objects within the specified collection. This is useful for limiting interactions to certain objects or environments.

Battle

Reference

Panel:

Particle System ▸ Physics ▸ Battle

Health

Initial boid health when born.

Strength

Maximum caused damage per second on attack.

Aggression

Boid will fight this time stronger than enemy.

Accuracy

Accuracy of attack.

Range

Maximum distance of which a boid can attack.

Misc

Reference

Panel:

Particle System ▸ Physics ▸ Misc

Banking

Amount of rotation around velocity vector on turns. Banking of 1.0 gives a natural banking effect.

Pitch

Amount of rotation around side vector.

Height

Boid height relative to particle size.

Relations

Reference

Panel:

Particle System ▸ Physics ▸ Relations

Target

This list view allows you to set up other particle systems to react with the boids.

Target Object

A data ID to select an object with a particle system set on.

System

Index of the *Object*'s particle system as set in the list view in the particle panel.

Mode

Enemy:

Setting the type to *Enemy* will cause the systems to fight with each other.

Friend:

Will make the systems work together.

Neutral:

Will not cause them to align or fight with each other.

Deflection

Boids will try to avoid deflector objects according to the Collision rule's weight. It works best for convex surfaces (some work needed for concave surfaces).

Force Fields

As other physics types, Boids is also influenced by external force fields.

In addition, special *Boid* force fields can be used with the Boids physics. These effectors could be predators (positive Strength) that boids try to avoid, o targets (negative Strength) that boids try to reach according to the (respectively) *Avoid* and *Goal* rules of the *Boid Brain*.

Boid Brain

Reference

Panel:

Particle System ▸ Physics ▸ Boid Brain

The Boid Brain panel controls how the boids particles will react with each other. The boids' behavior is controlled by a list of rules. Only a certain amou of information in the list can be evaluated. If the memory capacity is exceeded, the remaining rules are ignored.

The rules are by default parsed from top-list to bottom-list (thus giving explicit priorities), and the order can be modified using the little arrows buttons on the right side.

Rule Evaluation

There are three ways to control how rules are evaluated:

Average

All rules are averaged.

Random

A random rule is selected for each boid.

Fuzzy

Uses fuzzy logic to evaluate rules. Rules are gone through top to bottom. Only the first rule that affect above the *Rule Fuzziness* threshold i evaluated. The value should be considered how hard the boid will try to respect a given rule (a value of 1 means the Boid will always stick t it, a value of 0 means it will never). If the boid meets more than one conflicting condition at the same time, it will try to fulfill all the rules according to the respective weight of each.

Note

A given boid will try as much as it can to comply to each of the rules it is given, but it is more than likely that some rule will take precedence on other in some cases. For example, in order to avoid a predator, a boid could probably "forget" about Collision, Separate and Flock rules, meaning that "while panicked" it could well run into obstacles, e.g. even if instructed not to, most of the time.

In Air

The current rule affects boids while they are flying.

On Land

The current rule affects boids while they are not flying.

Goal Rule

Seek goal.

Object

Specifies the goal object. If not specified, Boid force fields with negative Strength are used as goals.

Predict

Predict target's movements.

Avoid Rule

Avoid "predators".

Object

Specifies the object to avoid. If not specified, Boid force fields with positive Strength are used as predators.

Predict

Predict target's movements.

Fear Factor

Avoid object if danger from it is above this threshold.

Avoid Collision Rule

Avoid objects with activated Deflection.

Boids
: Avoid collision with other boids.

Deflectors
: Avoid collision with deflector objects.

Look Ahead
: Time to look ahead in seconds.

Separate Rule

Boids move away from each other.

Flock Rule

Copy movements of neighboring boids, but avoid each other.

Follow Leader Rule

Follows a leader object instead of a boid.

Distance
: Distance behind leader to follow.

Line
: Follow the leader in a line.

  Queue Size
  : How many boids that are allowed to follow in a line.

Average Speed Rule

Maintain average velocity.

Speed
: Percentage of maximum speed.

Wander
: How fast velocity's direction is randomized.

Level
: How much velocity's Z component is kept constant.

Fight Rule

Move toward nearby boids.

Fight Distance
: Attack boids at a maximum of this distance.

Flee Distance
: Flee to this distance.

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