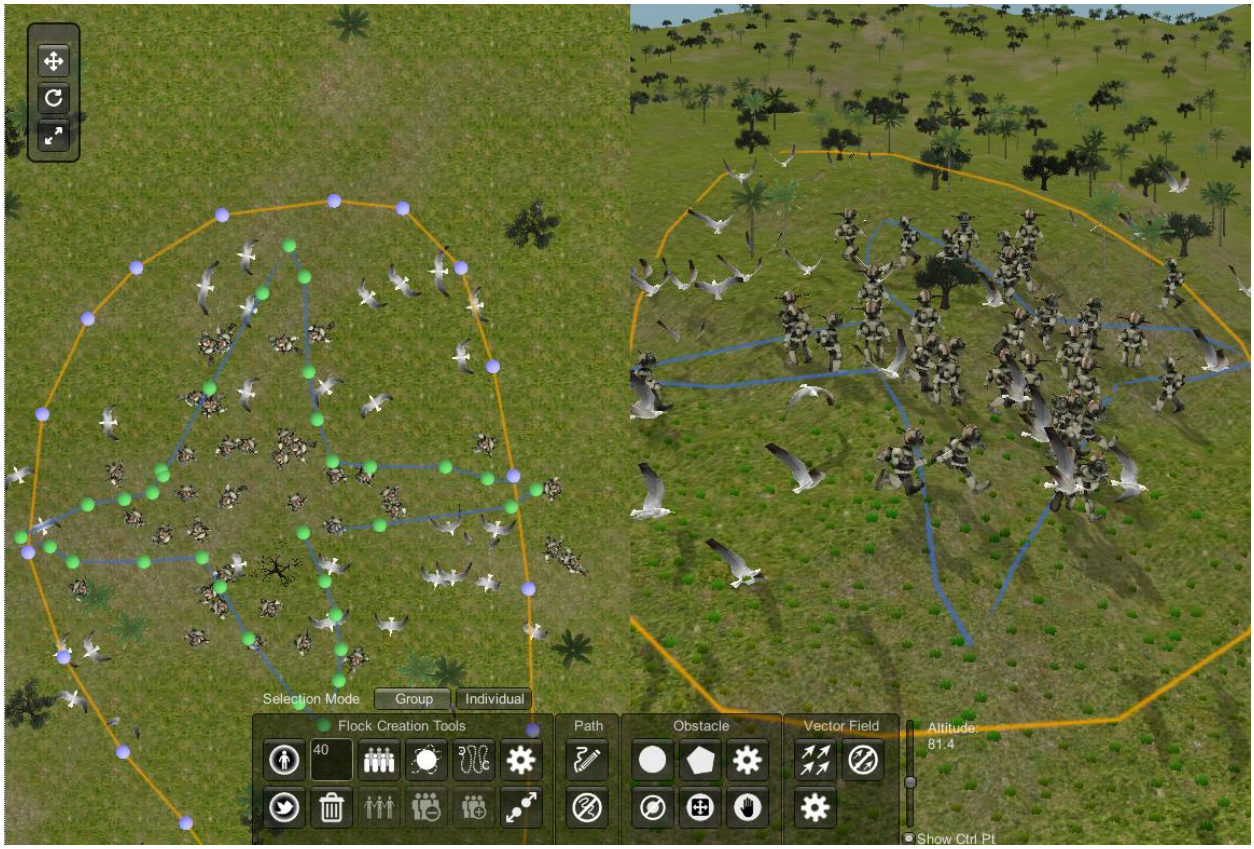
Crowd Simulation Demo Walkthrough



Crowd Simulation Solution for UNITY

Demo Walkthrough

Contents

1. Introduction 3
2. Main Settings 4
3. Controls 5
4. Creating a group of game characters 6
5. Moving, Rotating and Shrinking the Group 7
6. Morphing from one shape to another 8
7. Perform Path following 8
8. Modifying the movement behavior 9
9. Leave Group/Join Group 10
10. Form group 12
11. Adding Obstacles 12
12. Moving/Stopping the obstacle 13
13. Adding vector fields to simulate environmental forces 14
14. Collision and Field Flags 16

1. Introduction

Crowd Simulation API is a crowd simulation plugin developed for Unity game developers. It is designed to enhance your creativity and improve productivity. You can easily simulate a crowd of hundreds and even up to a thousand of autonomous individual characters. In order to achieve this, we have created a suite of scripts and libraries from the ground up that provide a more intuitive and natural way of creating stunning crowd simulations.

As game developers, it is important to us that the Crowd Simulation API is kept simple, clean and non-intrusive. Installation only requires one DLL, a couple of scripts and nothing else that would clutter your workspace. Our goal is to bring a fully automated crowd simulation tool, one that is effective, efficient and easy to use, available on the Unity platform.

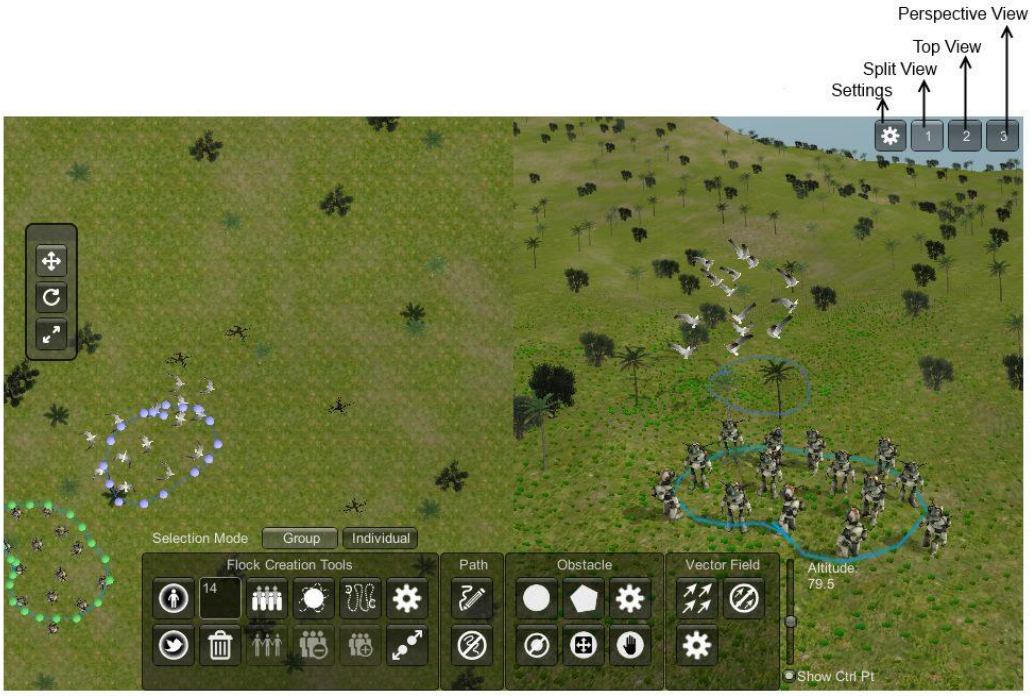
With this Crowd Simulation API, you will be able to enjoy game development by

- Utilizing the intuitive and easy of use editor.
- Creating movement of large number of game characters.
- Defining groups of crowd by drawing the formation shape.
- Customizing autonomous crowd behaviors.
- Simulating environmental forces easily using Vector Fields.

2. Main Settings

Demo Screen

Below is the screen you are presented with when the demo launches.



Demo Settings

Clicking on the settings icon brings up this dialog.

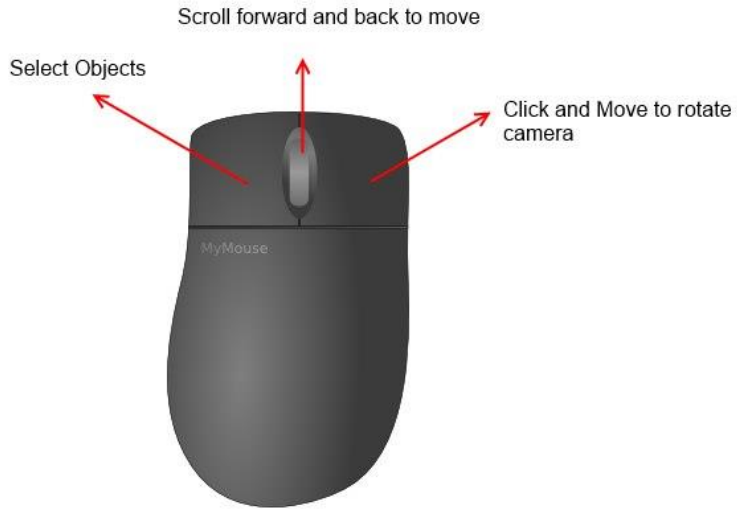
Parameters	
Ignored Speed	The minimum speed that the agent will start to move
Acceleration To Ignore	The minimum magnitude of the acceleration that will be applied to the agent. Any acceleration lower than the specified value will be ignored.
Dist. to slowing down	The distance between the agent and its destination that the agent will start to slow down.
Self-Organize in Formation	Whether the agents within the same FlockGroup will exchange their destination position to reduce the overall distance travelled.
Self-Organize in Formation	Whether the agents within the same FlockGroup will exchange their destination position to reduce the overall distance travelled.
Enable Terrain Effect	Whether the gradient of the terrain will affect the movement speed of ground moving FlockMembers.
Warp Terrain	Whether FlockMembers exiting the specified boundary will get teleported to the opposite end of the map.

3. Controls

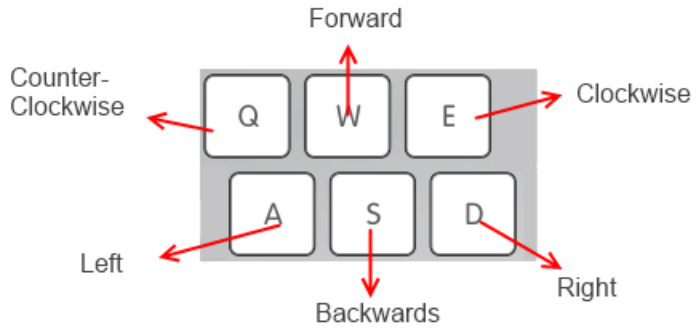
The left panel shows the top down view with the current camera location, and the right panel shows the 3D view.

Here are the controls to move through the scene.

Mouse Controls

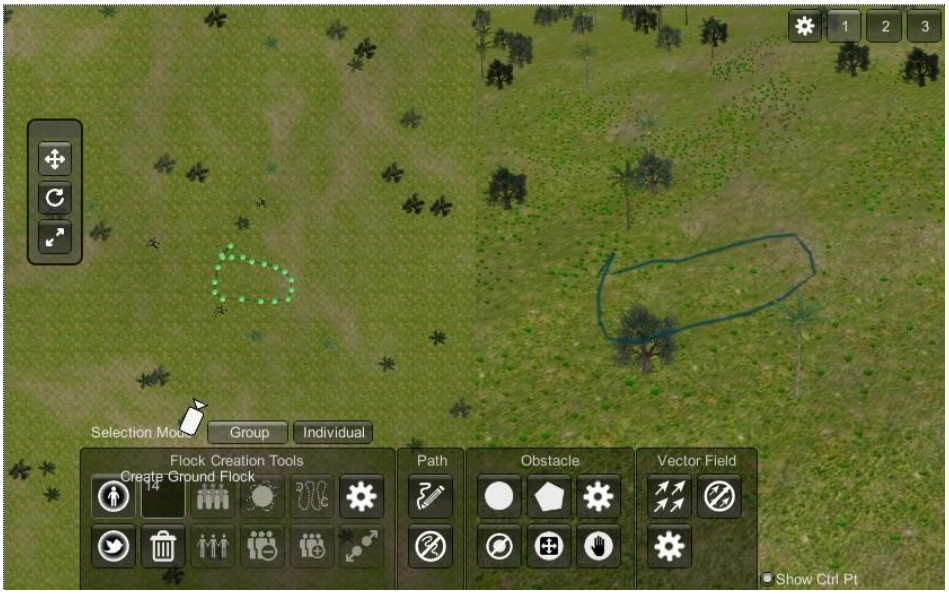


Keyboard Controls



4. Creating a group of game characters

1. To create a group of ground characters, first click on the **Create Ground Flock**  icon, or the **Create Flying Flock**  icon. Then Draw on either the top view or 3D Perspective view, like below.

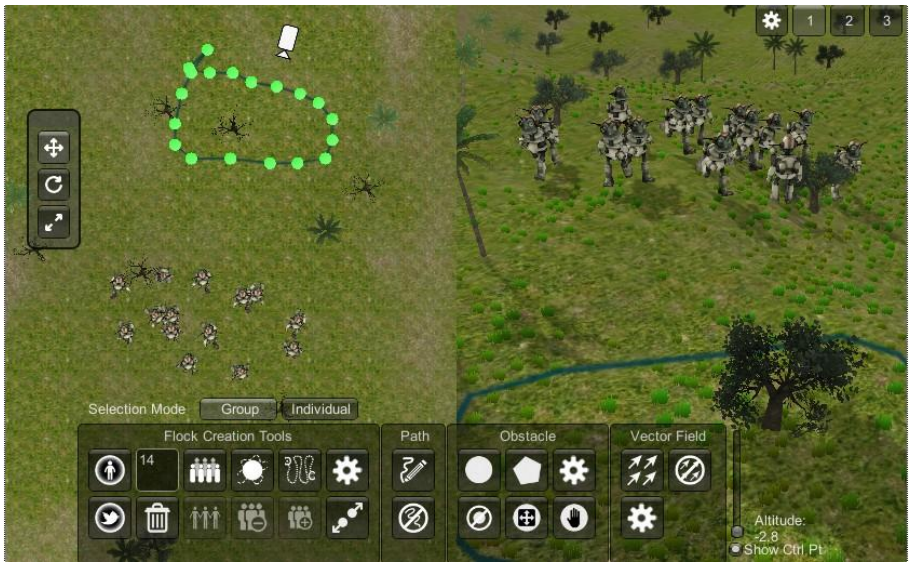


2. Next, enter the number of characters you want on the number field beside it. 
Then click in the shape you have drawn, to select it.

3. Lastly, click on the **Populate Agent** icon  to populate the characters in the shape drawn.

5. Moving, Rotating and Shrinking the Group

To move the flock around, just click in the shape you have made and move it to where you want.



To Rotate the Group:

1. Click on the **Rotate**  icon
2. Select the flock
3. Click and while holding the left mouse button, drag left or right to rotate the flock shape counterclockwise or clockwise.

To enlarge/shrink the flock shape:

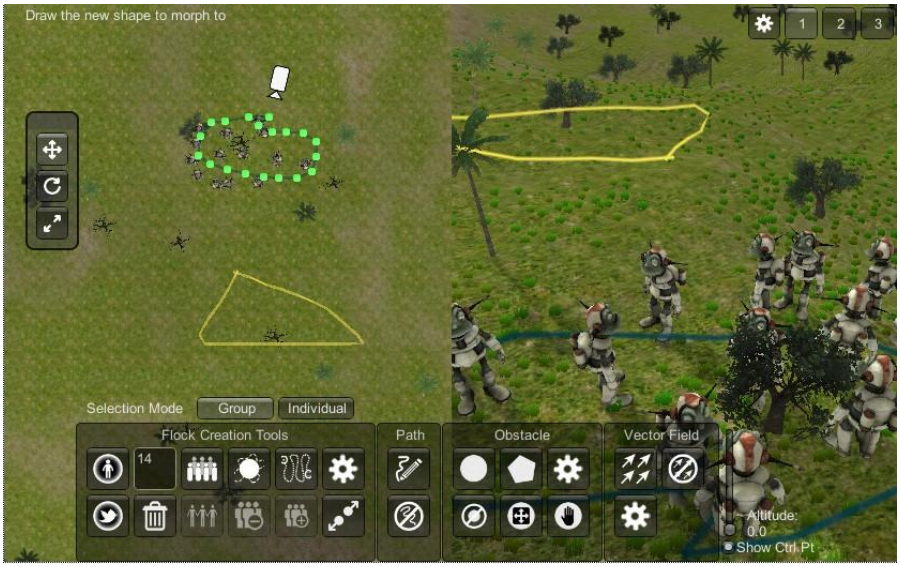
1. Click on the **Scale**  icon.
2. Select the flock.
3. Click and while holding the left mouse button, drag up or down to enlarge or shrink the flock shape.

6. Morphing from one shape to another

To change the flock shape:

1. Click in your shape. 
2. Click on the **Morph to new formation shape** icon.
3. Draw a new shape where you want it.

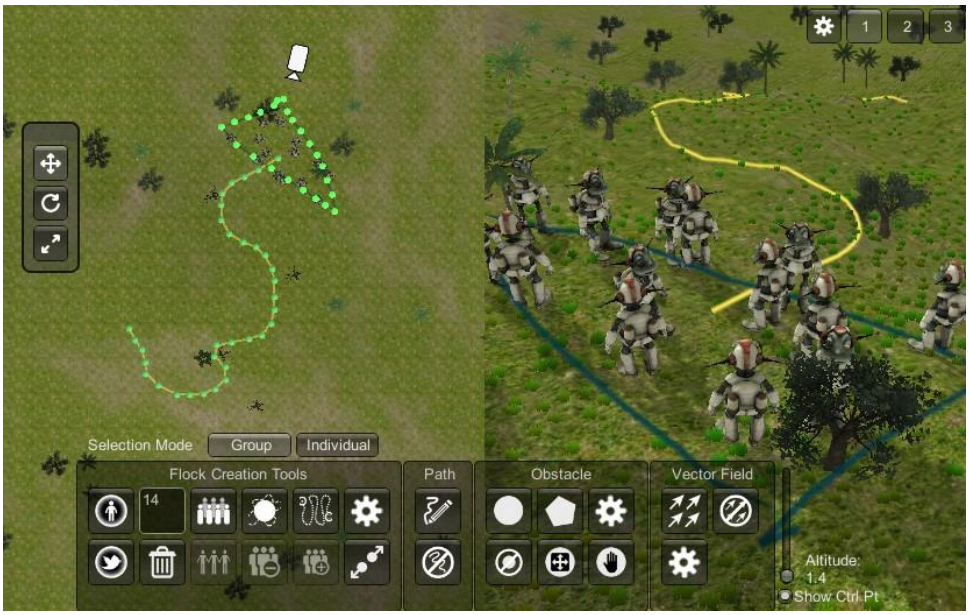
The characters will move to the new shape.



7. Perform Path following

To perform path following:

1. Click on the **Create a path** icon. 
2. Draw your path, starting from inside your shape.



3. Click on the Perform path following icon.  Then click on one of the green control points that make up the path.
4. The characters will now follow the path.

8. Modifying the movement behavior

The movement of the flock is based on a modified version of the "Boid" model.

Click on the **Flock Property** icon  then click on the flock you want to edit, to bring up the flock properties dialog.

The flock properties you can change are:

Parameters	
Max Speed	The maximum speed that the agent will move at.
Min Speed	The minimum speed that the agents will move while at rest.
Radius	Radius of the circular space that the agent will occupy
Max Force	The maximum force that is applied on each agent in each updates
Collision flag	An 8bit flags that is used to determine whether the agents can travel through the obstacles. For a more detailed explanation, please refer to the Collision and Field flags section.
Enable Terrain Effect	Whether the gradient of the terrain will affect the movement speed of ground moving FlockMembers.
Warp Terrain	Whether FlockMembers exiting the specified boundary will get teleported to the opposite end of the map.

9. Leave Group/Join Group

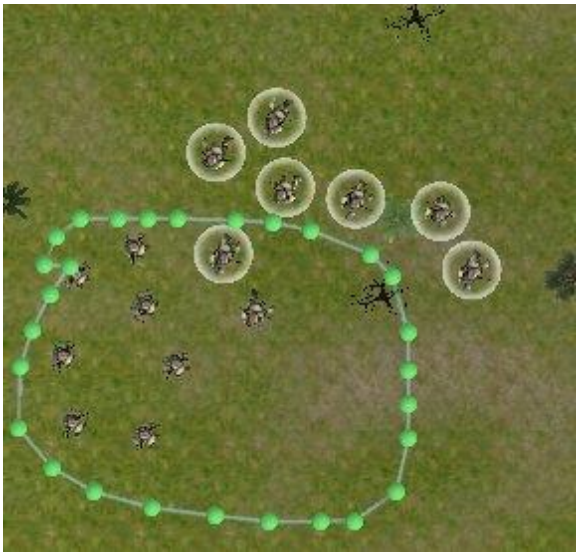
To remove some flock members from a group:

1. Click on the individual tab

2. Then left click and drag to select some characters

3. Then click on the **Leave Group** icon.  . The chosen characters will now have left the group. Move your flock and they will not follow.

4. If you want to add them back to the group, reselect them, and click the **Join Group** icon  then click in your flock shape, they will rejoin back.

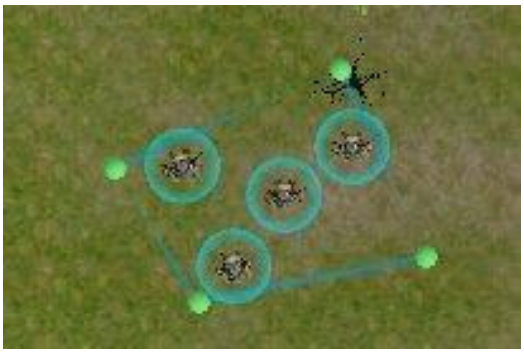


10. Form group

To form a new Group:

1. Click on the individual tab,

2. Click on the Form Group icon 
3. Select the agents that will form a new group.
4. The flock will form into a new group.

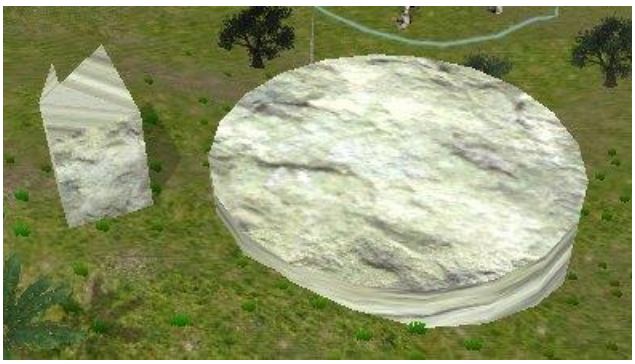


11. Adding Obstacles

To add an obstacle, you can either:

1. Click on the **Place a round obstacle** icon  , then click on the top or perspective view.
2. Click on the **Draw a polygonal obstacle** icon  . Then left click in the 2D/perspective view to set the points of the polygon, and right click to create it.

Polygon Obstacle and Round Obstacle

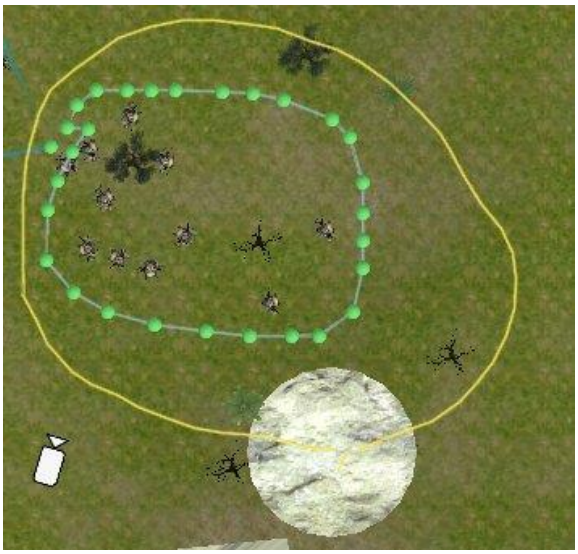


12. Moving/Stopping the obstacle

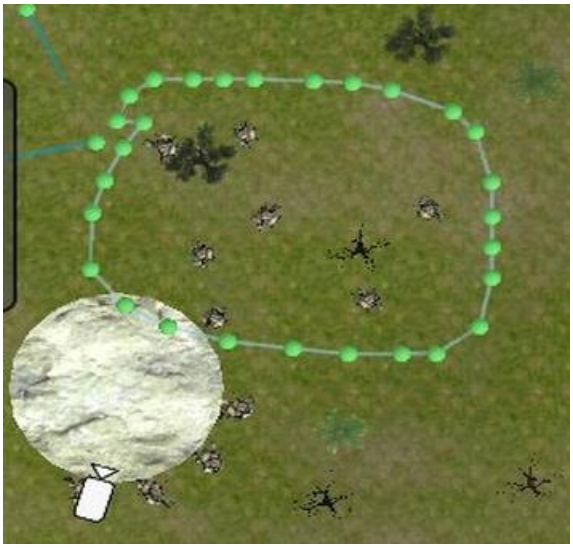
Obstacles can be made to move around a path.

Just click on the **Move Obstacle** icon  , click on an obstacle and draw the path you want it to move in.

The obstacle will move continuously along the path.



Object moving in a path and pushing away characters in the path.



In order to stop the obstacle, click on the **Stop a moving obstacle** icon 

13. Adding vector fields to simulate environmental forces

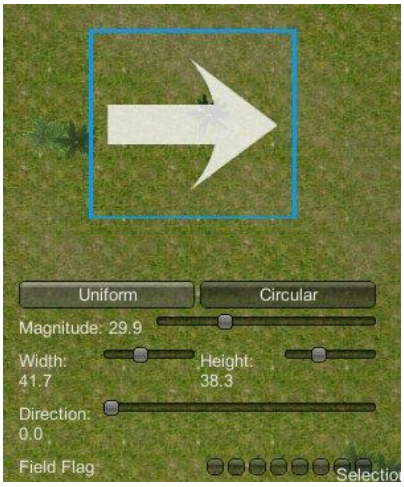
There 2 different kinds of fields you can create in the Crowd Simulation Demo.

Uniform Fields and Circular Fields.

They are accessed through the **Add a vector field** icon. 

Uniform Fields

Uniform fields act in one direction

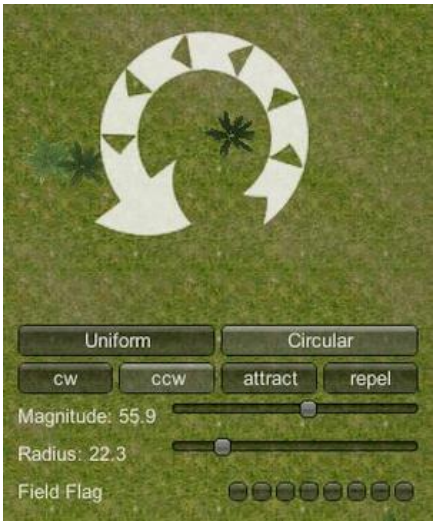


You can control the Magnitude, Width, Height, and Direction and set the field flags of the uniform field. Characters travelling in the same direction of the field will have an acceleration, while those travelling against it will be slowed.

Circular Fields

As the name implies, circular fields rotate and can be clockwise, anti-clockwise, attract or repel

A Circular field



An Attract field

Unlike the uniform field, you can only set the magnitude, radius and field flags for a circular field.

14. Collision and Field Flags

The Collision and Field Flags are an 8-bit flag parameter used to identify whether a specific agent can pass the specific obstacle, or is unaffected by a force. The “Collision Flag” and "Field Flag" parameters are used to indicate which kinds of obstacle it can go through.

As for the “Collision Flag” parameter in obstacle, it is used to indicate which kinds of agent can pass through it. The agent can pass through this obstacle when any of the flags positions match.

As an example, if the collision flag of the flock is checked at the 6th to 8th position, as shown below,

It will pass through an obstacle that has any of the flags in the 6th to 8th position set, as shown below.

Flock characters ignoring the obstacle.