Ant Colony Plugin

Description

The ant colony optimization algorithm (ACO) is a probabilistic technique for solving computational problems which can be reduced to finding good paths through graphs. Artificial ants stand for multi-agent methods inspired by the behavior of real ants. It helps to solve various tasks, including vehicle routing, internet routing [Wiki].

Finding an optimal path with brute force on the other hand would require a lot of computer power: (n-1)!/2 variant to compare, where n is the number of agents. For 15 points it would require to compare 43,589,145,600 paths.

With this plugin will be able to find the route for the same amount of points without notice.

Videos:

- Finding an optimal path in changing environment using Ant Algorithm link;
- How changing obstacles affects path, calculated using Ant Algorithm link;
- Ant Algorithm in action for round objects on a moving platform: link;
- Ant Algorithm represents Eiffel Tower made of different paths: link;
- Ant Algorithm runtime path calculations for round objects link;
- Drawing a path with Ant Algorithm using the editor in Unreal Engine 4 link.

Features:

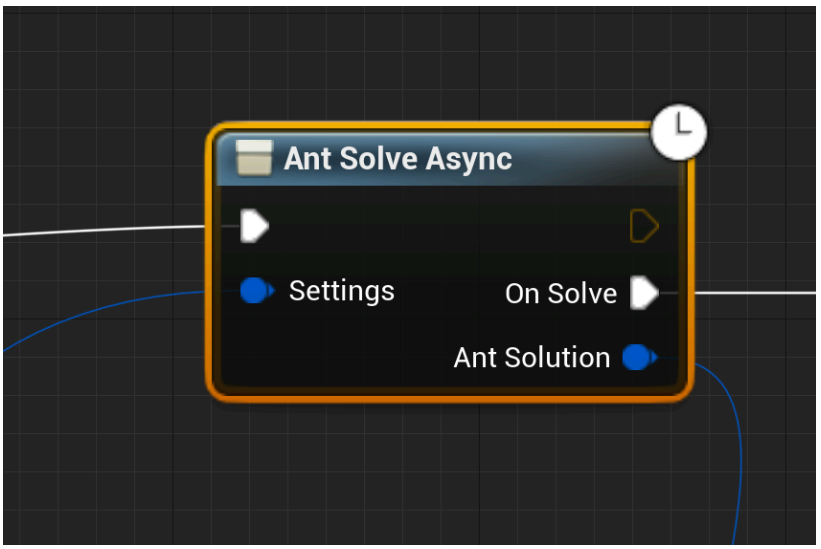
- Finding an optimal path for actors in the scene;
- Great for NPC's patrolling path automation;
- Editing path in the editor with WYSIWYG concept;
- Adapting path to moving targets;
- Multithreaded calculations will not freeze the game thread;
- Included Automation tests will help you to modify the solver for your needs if you want to.

Notes: This plugin has its limits on the size of the path it can solve. It was tested for 15 points with stable results.

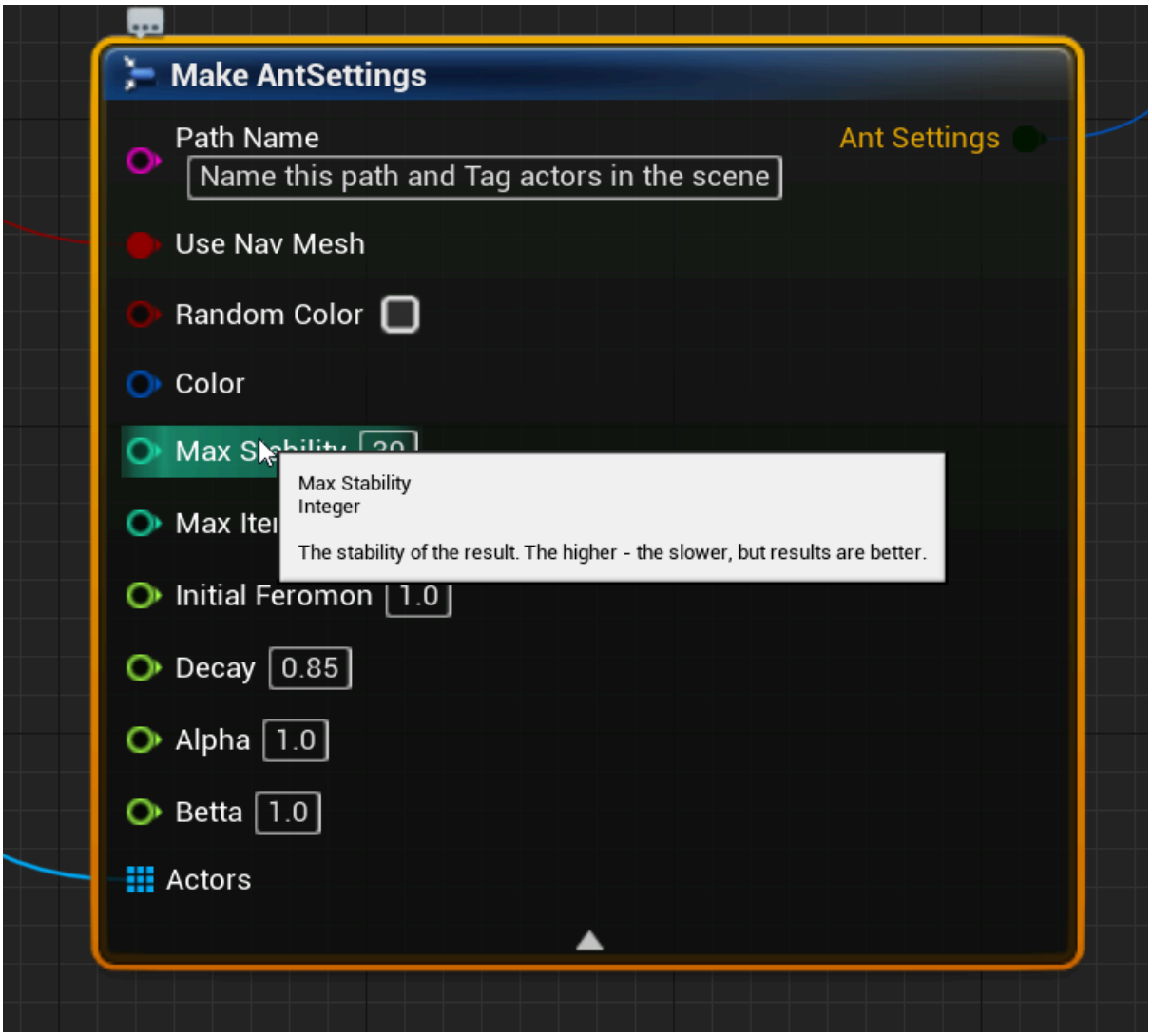
Tutorial

Path for AI

To calculate the path for AI add async node “Ant Solve Async” into the bp, which you choose for path calculations. It can be any blueprint.



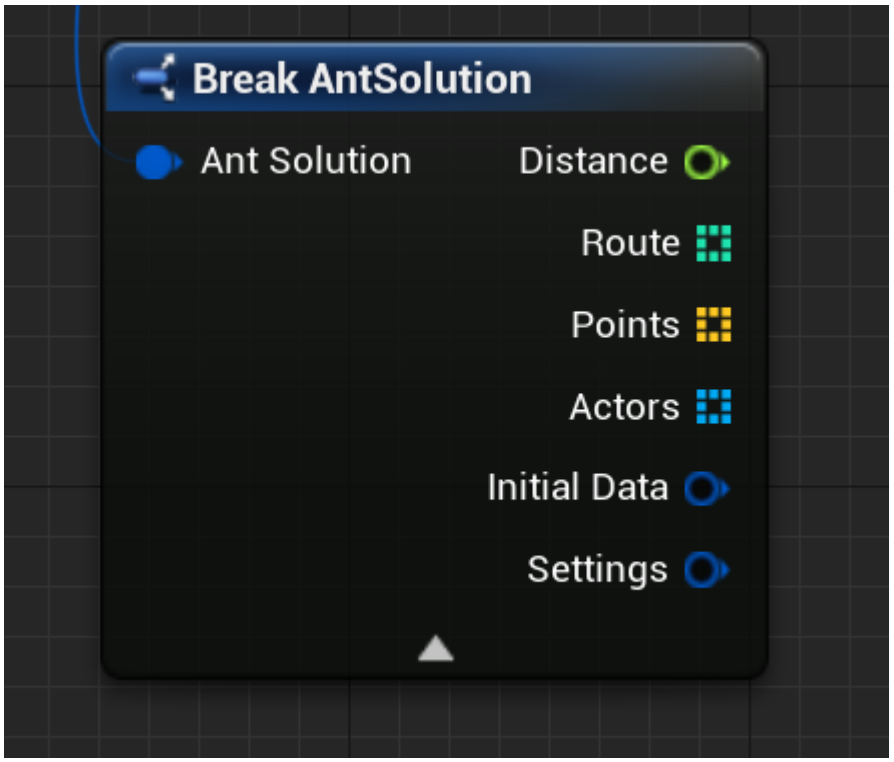
Please provide setting to make calculations possible:



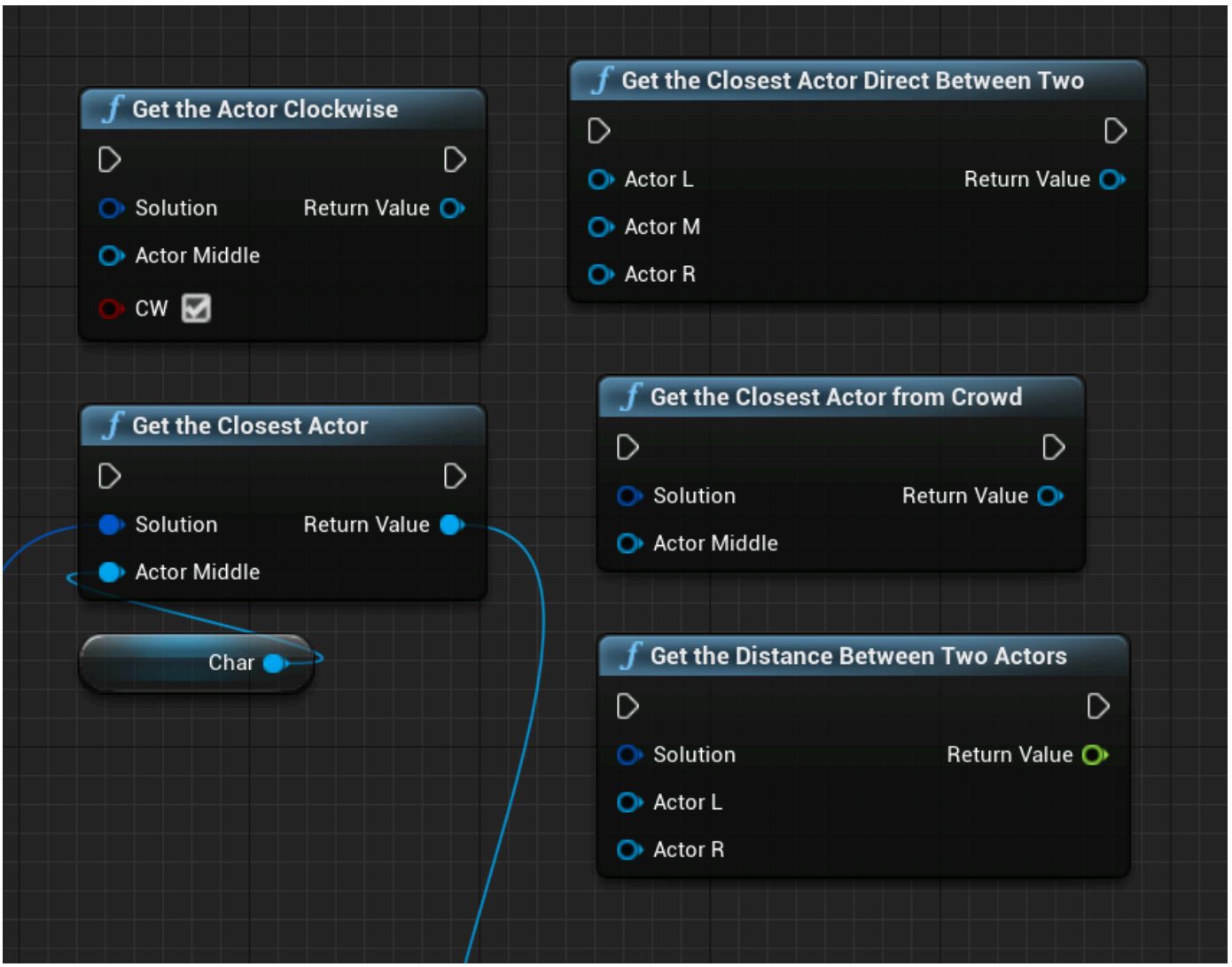
Each field has a short description, when you hover mouse on it. The default values will be fine to begin with, except the “Actors” array.
Please provide an array of actors, between which you want to build the path.

Solution

After the solution is ready, you can read it on connecting the “On Solve” execution line with the node of your interest.



Please note, that if you want to calculate the solution dynamically, you might have the path in the reverse order every time you get the solution. It is so, since the algorithm is probable in nature. To overcome these difficulties you can use these methods provided:



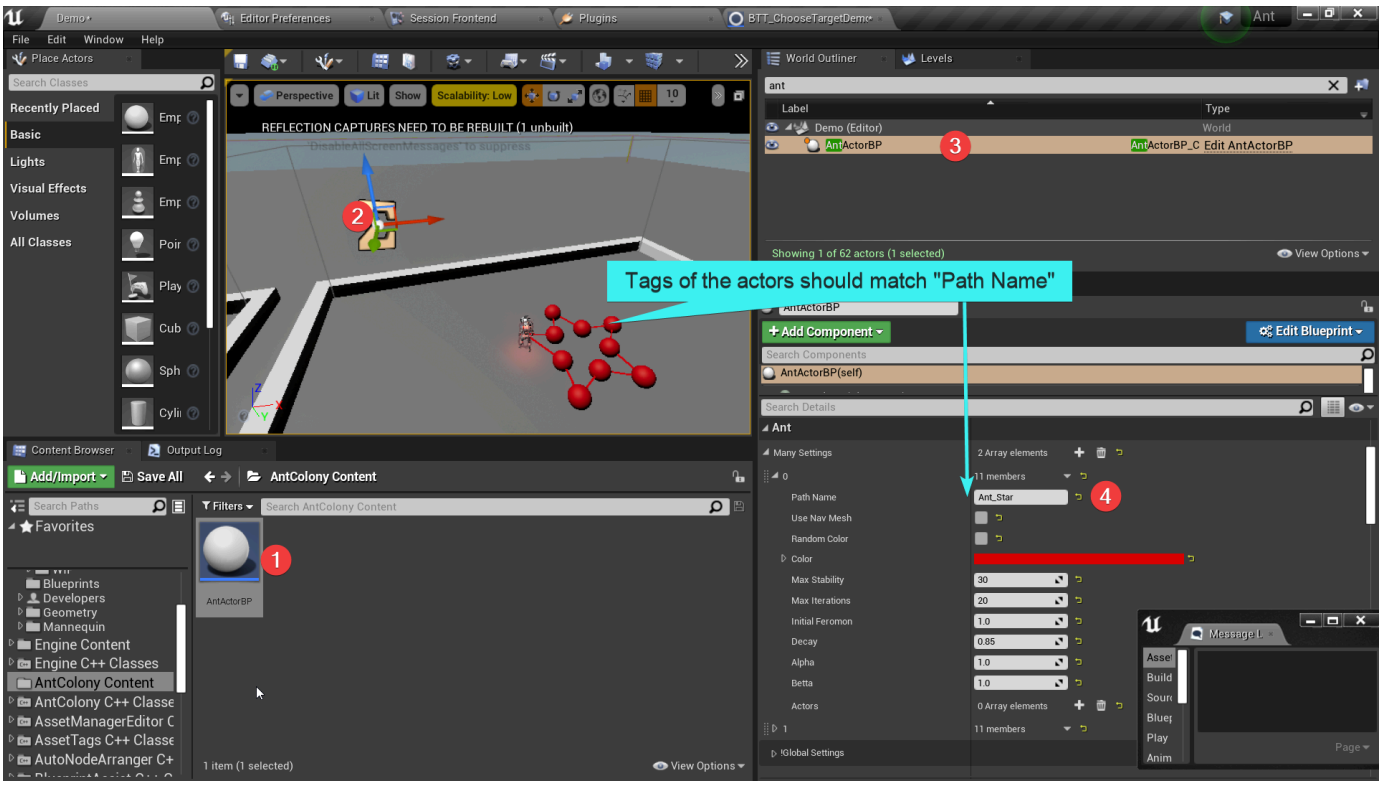
Visualization

To visualize the path it is not necessary to follow this guide, since all path details are provided in the solution structure mentioned above. You can connect result points with lines to achieve looks which will suit you best. But as a starter for debugging purposes you can use the following techniques.

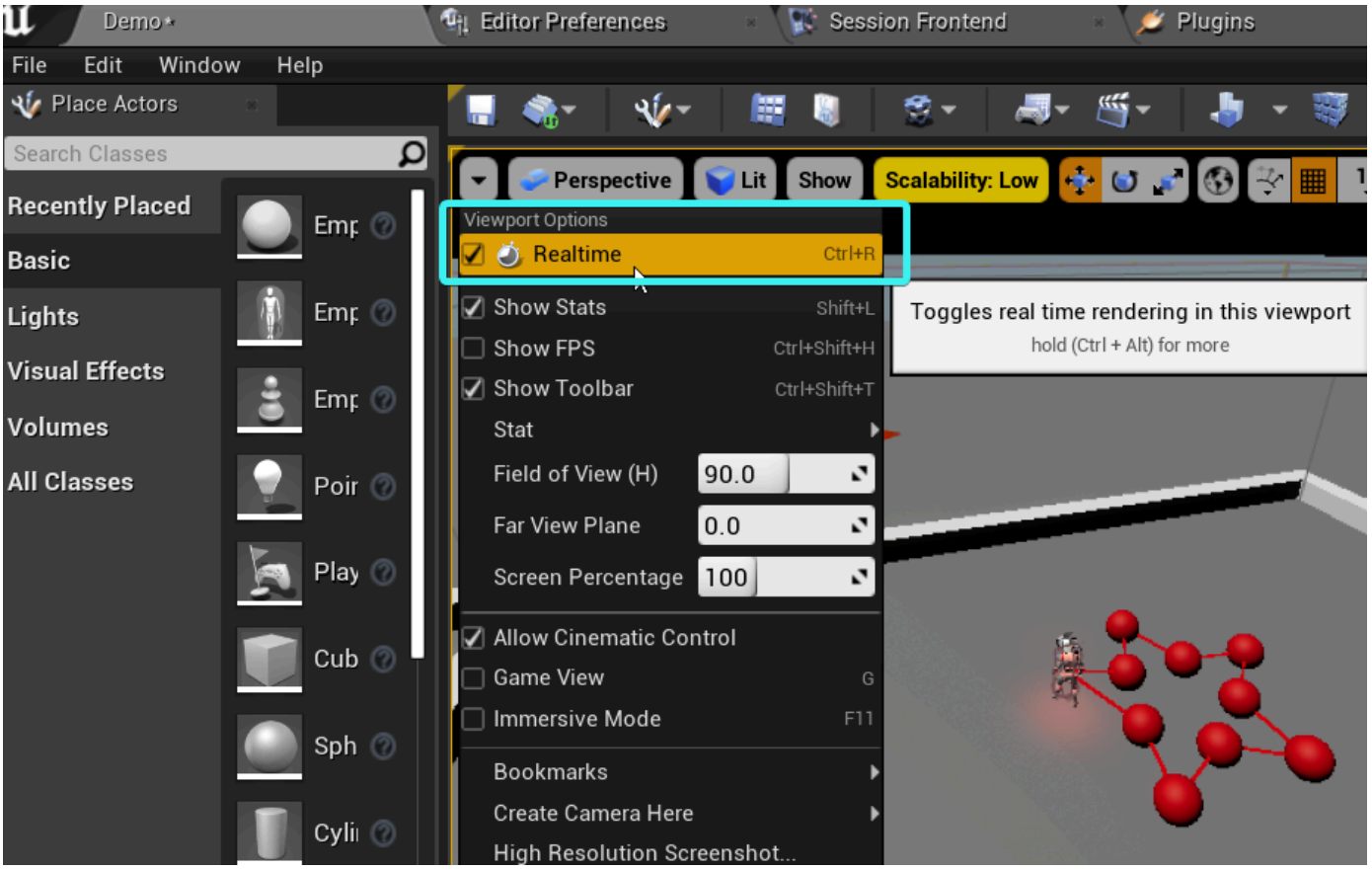
In Editor

To see the resulting path in editor place the “AntActorBP” in the scene.

Blueprint'/AntColony/AntActorBP.AntActorBP'

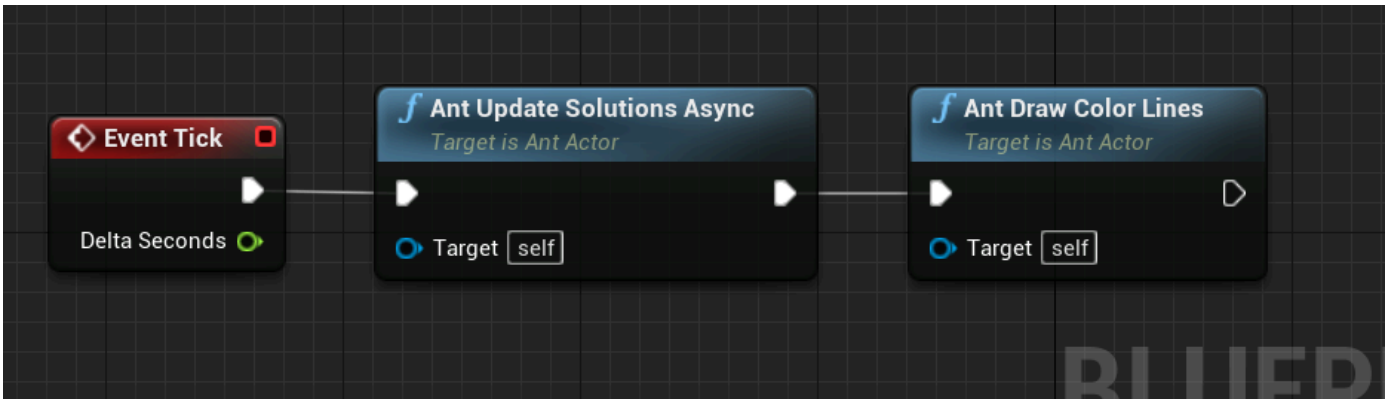


If you don't see the result, please check if this Realtime checkmark is ticked:



In Game

To draw lines between paths runtime open AntActorBP and connect these nodes:



To understand more about the functionality of this plugin, please download the template (plugin required), provided in the description. It has some basic usage examples, which might fit the common use cases.