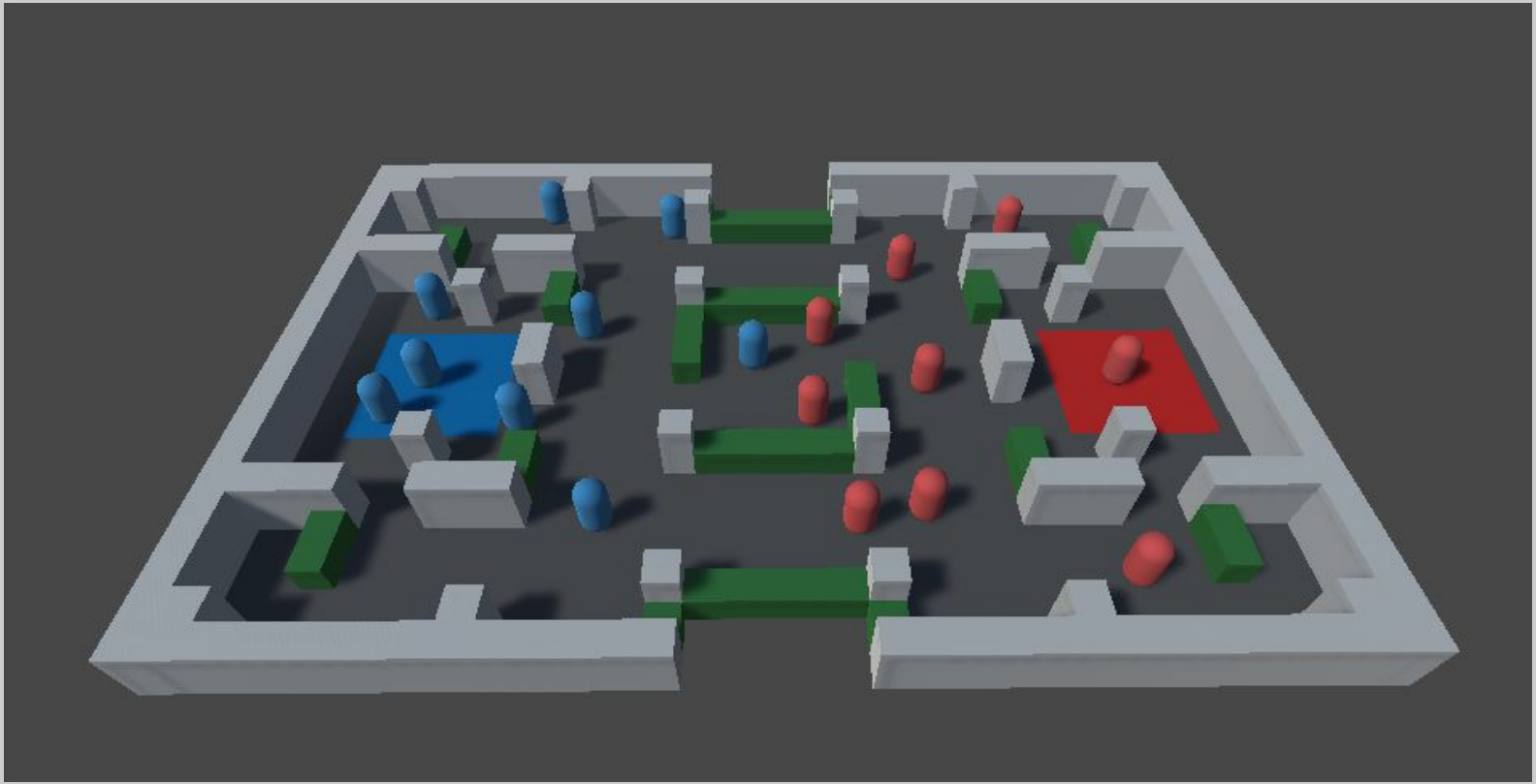
Neural Evolution of Augmented Topologies

Wolf Van Herreweghe

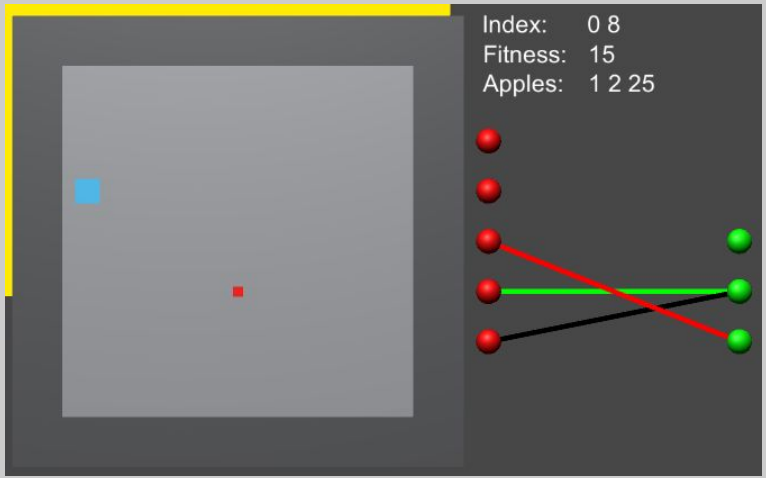
End Goal



Test Projects

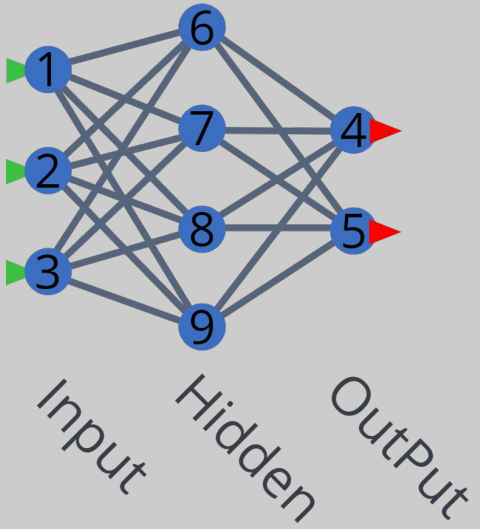
Color Matching

Snake

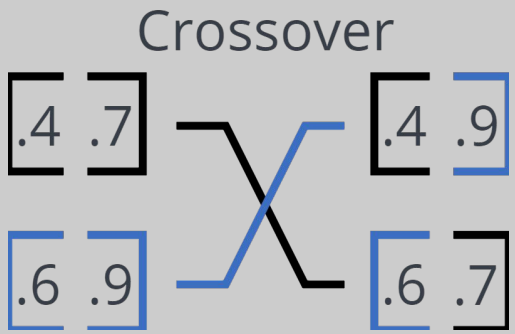


The Basics

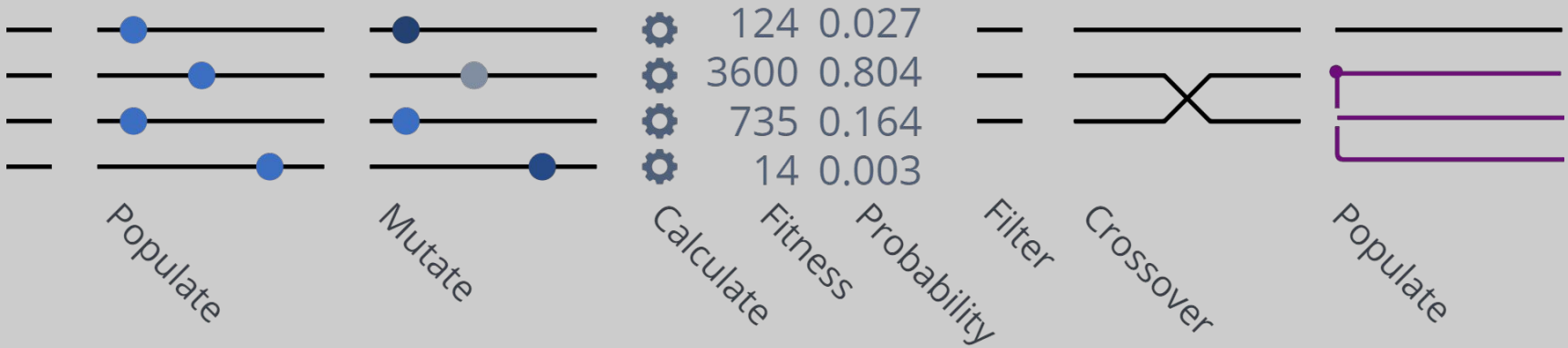
Neural Networks



Genetic Algorithms



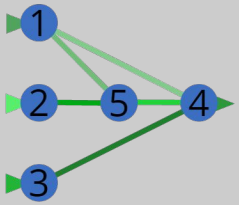
Basic Evolution steps



CROSSOVER

Parent 1

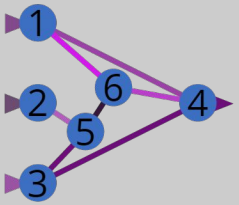
1	2	3	4	5	8
1→4	2→4	3→4	2→5	5→4	1→5
	DISABLED				



Parent 2

1	2	3	4	5	6	7	9	10
1→4	2→4	3→4	2→5	5→4	5→6	6→4	3→5	1→6
	DISABLED			DISABLED				

Crossover



Parent 1

1	2	3	4	5	8
1→4	2→4	3→4	2→5	5→4	1→5
	DISABLED				

Parent 2

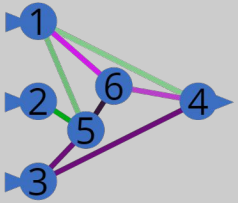
1	2	3	4	5	6	7	9	10
1→4	2→4	3→4	2→5	5→4	5→6	6→4	3→5	1→6
	DISABLED			DISABLED				
					Disjoint	Disjoint	Excess	Excess

Disjoint

50%

Offspring

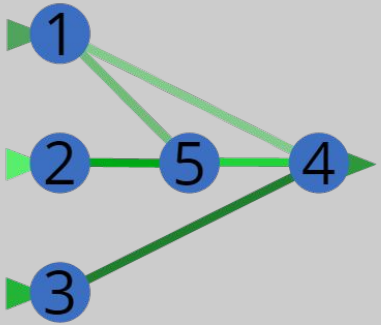
1	2	3	4	5	6	7	8	9	10
1→4	2→4	3→4	2→5	5→4	5→6	6→4	1→5	3→5	1→6
	DISABLED			DISABLED					

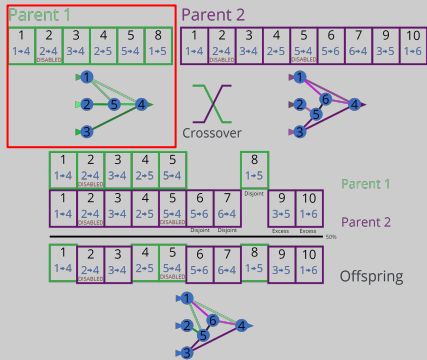


CROSSOVER

Parent 1

1	2	3	4	5	8
1→4	2→4 DISABLED	3→4	2→5	5→4	1→5

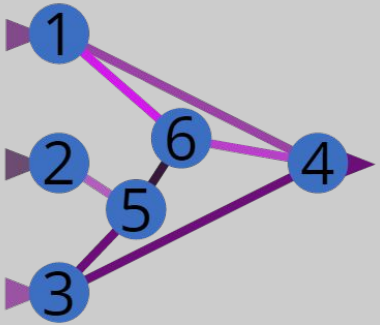


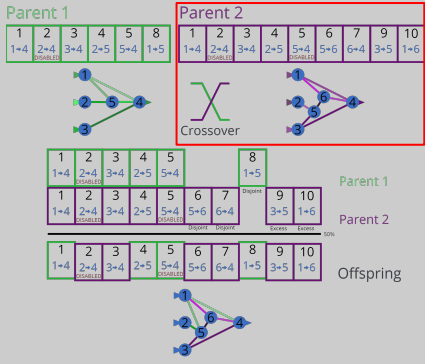


CROSSOVER

Parent 2

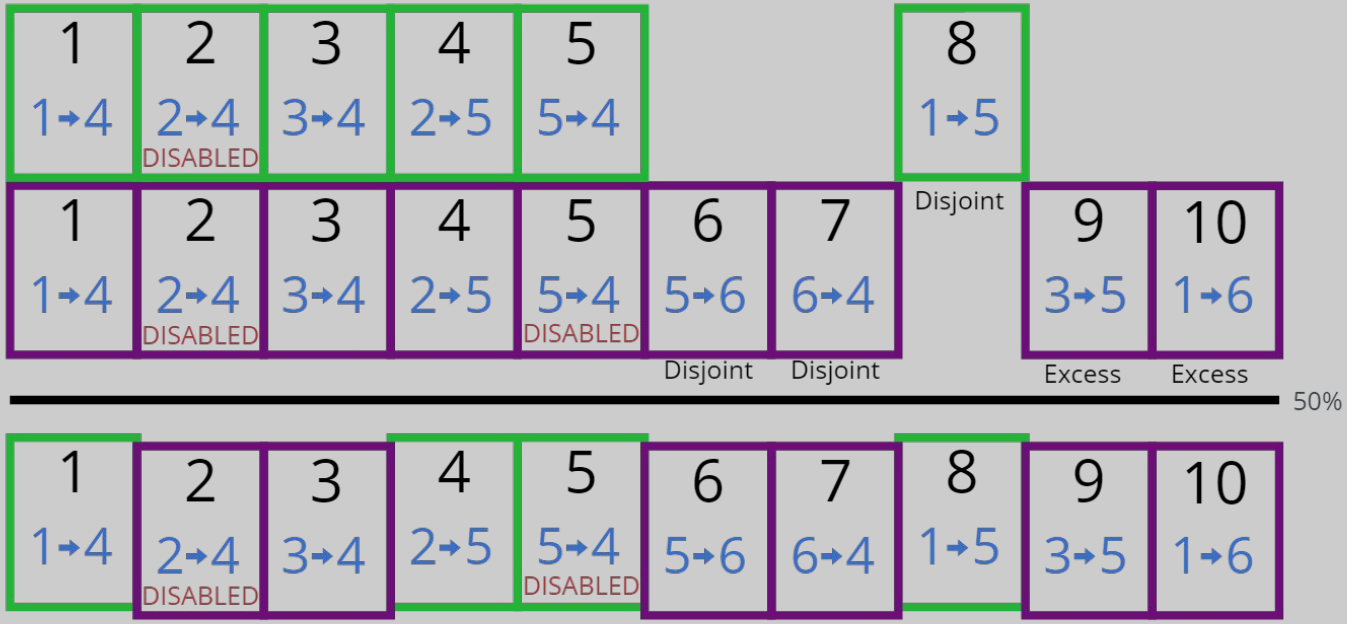
1	2	3	4	5	6	7	9	10
1→4	2→4 DISABLED	3→4	2→5	5→4 DISABLED	5→6	6→4	3→5	1→6





CROSSOVER

Crossover



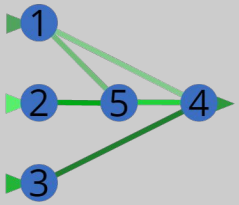
CROSSOVER

Parent 1

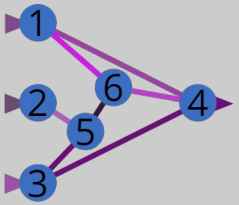
1	2	3	4	5	8
1→4	2→4 DISABLED	3→4	2→5	5→4	1→5

Parent 2

1	2	3	4	5	6	7	9	10
1→4	2→4 DISABLED	3→4	2→5	5→4 DISABLED	5→6	6→4	3→5	1→6



Crossover



Parent 1

1	2	3	4	5	8
1→4	2→4 DISABLED	3→4	2→5	5→4	1→5

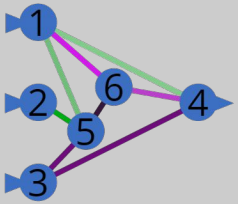
Parent 2

1	2	3	4	5	6	7	Disjoint	9	10
1→4	2→4 DISABLED	3→4	2→5	5→4 DISABLED	5→6	6→4	1→5	3→5	1→6
					Disjoint	Disjoint		Excess	Excess

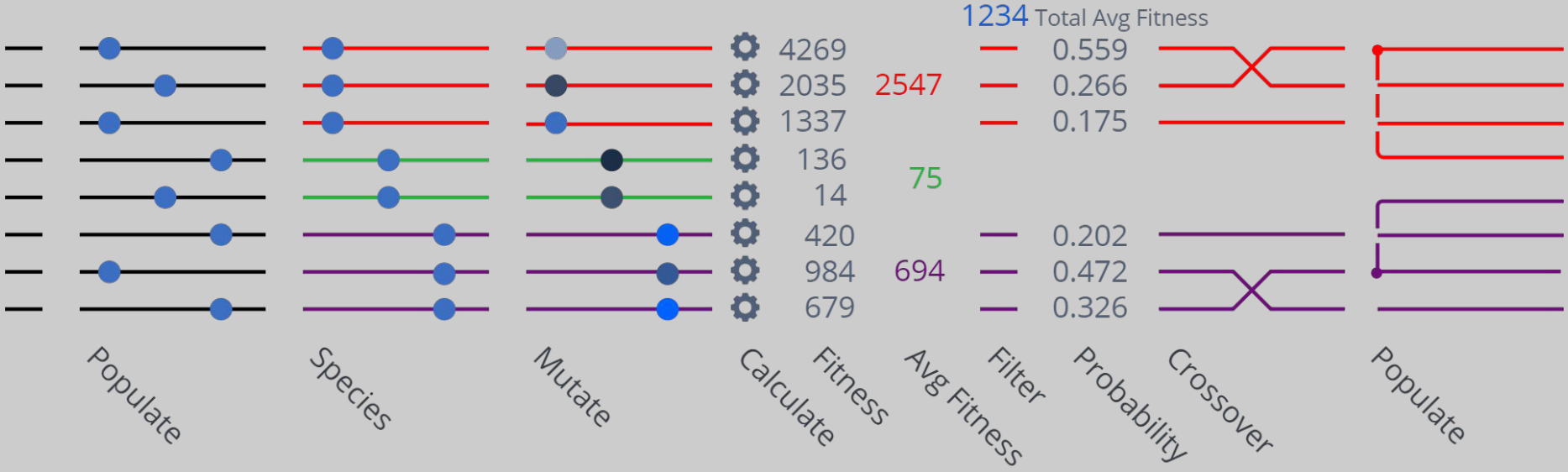
50%

Offspring

1	2	3	4	5	6	7	8	9	10
1→4	2→4 DISABLED	3→4	2→5	5→4 DISABLED	5→6	6→4	1→5	3→5	1→6



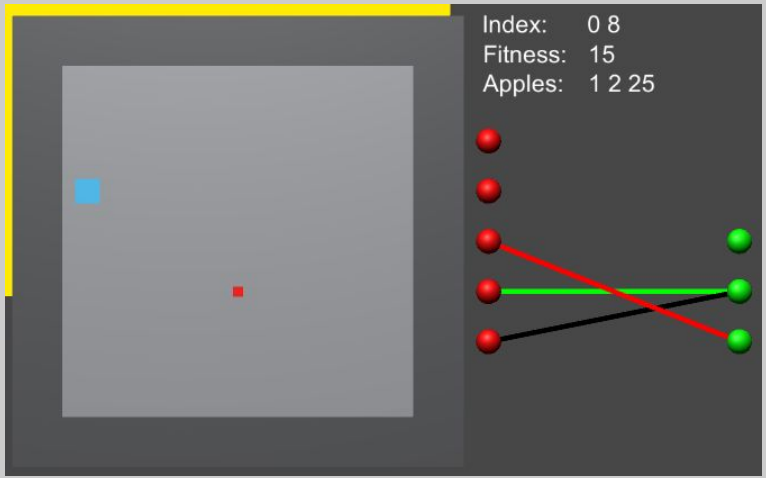
Species Based Evolution steps



Demos

Color Matching

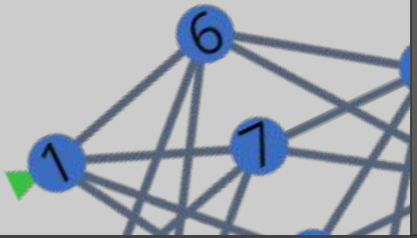
Snake

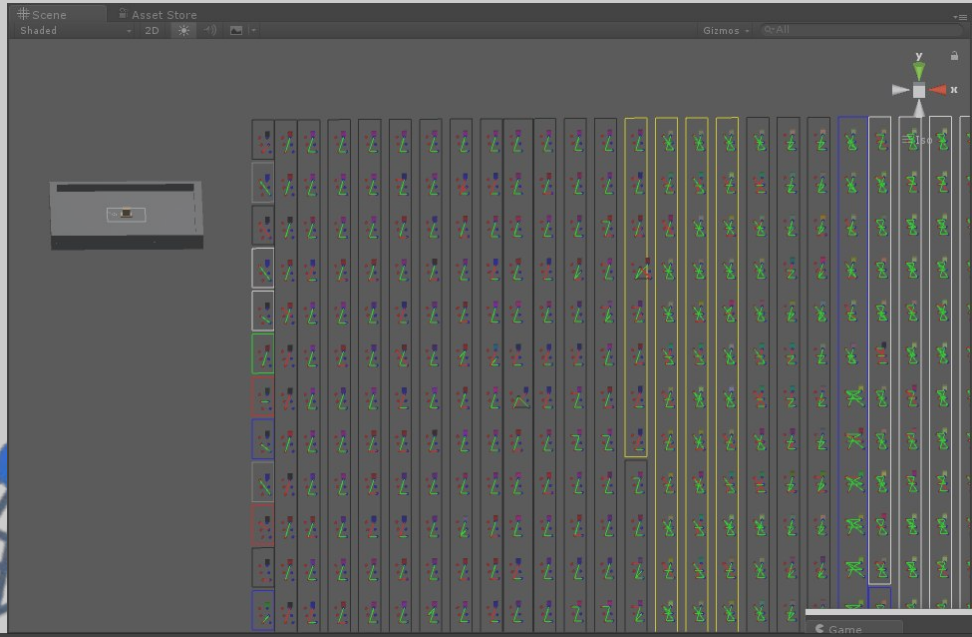


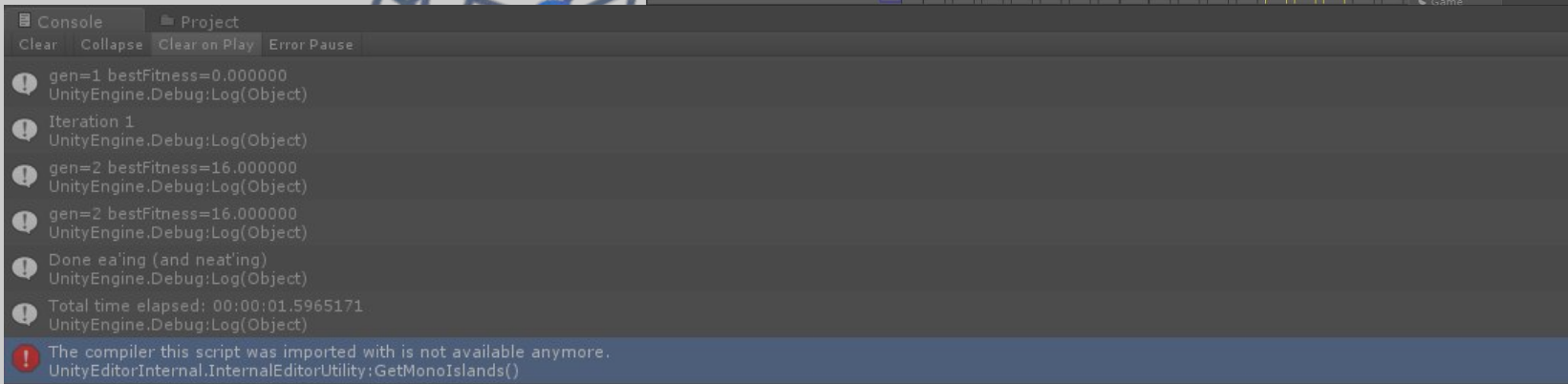
Difficulties

```
193
194
195             //Move the Head 1 Forward
196             _pos += _direction;
197             transform.position = new Vector3(_pos.x, 0.5f, _pos.y);
198
199             _positions.Add(_pos);
200             _directions.Add(targetDirection);
201
202             //Check if we ate the apple!
203             if (_pos == _applePos)
204                 NextApple();
205
206             _hungerBar++;
207             _lifeCounter++; //Amount of ticks alive
208         }
209     }
210
211     bool IsDead()
212     {
213         return IsDead(_pos);
214     }
215
216     bool IsDead(Vector2 pos, bool skipLoopCheck = false)
217     {
218         bool alive = !(pos.x > _fieldSize || pos.x < -_fieldSize || pos.y > _fieldSize || pos.y < -_fieldSize);
219         if (alive)
220             alive = !(_hungerBar >= 15 + 8 * AppleCounter);
221         if (alive && !skipLoopCheck && _directions.Count >= 5 && _hungerBar > 5)
222         {
223             int dirCount = _directions.Count - 1;
224             if (_directions[dirCount] == _directions[dirCount - 1] &&
225                 _directions[dirCount - 2] == _directions[dirCount - 3] &&
226                 _directions[dirCount] == _directions[dirCount - 2])
227             {
228                 alive = !(pos == _positions[_positions.Count - 5]);
```

Questions


6
1
7


Scene
Asset Store
Shaded
2D
Gizmos
Game


Console
Project
Clear
Collapse
Clear on Play
Error Pause
gen=1 bestFitness=0.000000
UnityEngine.Debug:Log(Object)
Iteration 1
UnityEngine.Debug:Log(Object)
gen=2 bestFitness=16.000000
UnityEngine.Debug:Log(Object)
gen=2 bestFitness=16.000000
UnityEngine.Debug:Log(Object)
Done ea'ing (and neat'ing)
UnityEngine.Debug:Log(Object)
Total time elapsed: 00:00:01.5965171
UnityEngine.Debug:Log(Object)
The compiler this script was imported with is not available anymore.
UnityEditorInternal.InternalEditorUtility:GetMonoIslands()