Building Artificial Life and Multi-Agent simulations using the Breve engine
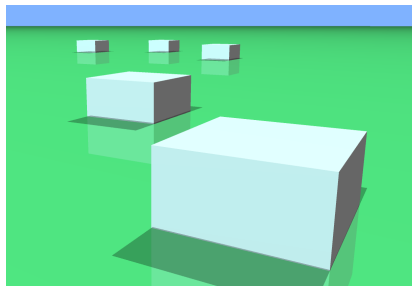
Wouter Bulten, Frank Dorssers & Robert-Jan Drenth

ACAIS: Life, June 6th 2013

ACAIS 2013

Goal of today

Investigating and building multi-agent and artificial life simulations.

Overview

Introducing breve

Past projects

Basis of a simulation

Building a simulation

Adding complexity

What we are going to build

ACAIS 2013

What is breve?

- Environment designed for simulation of realistic, 3D, multi-agent systems
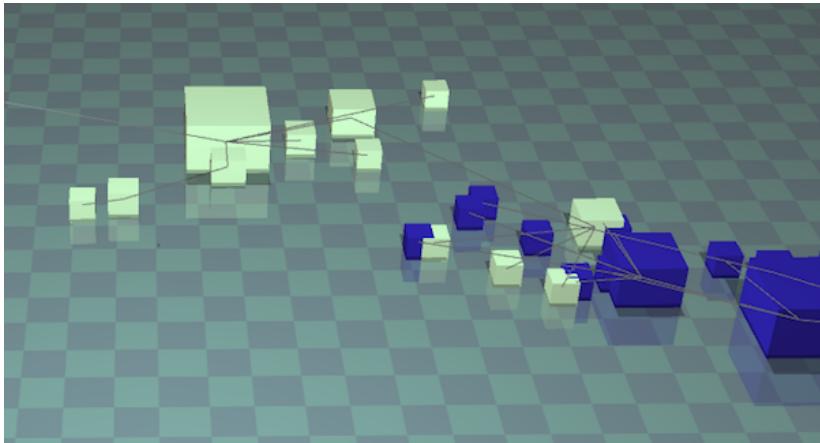- Created by Jon Klein (Hampshire College & Chalmers University)
- Autonomous agents

Types of simulation

- Multi-agent Simulations
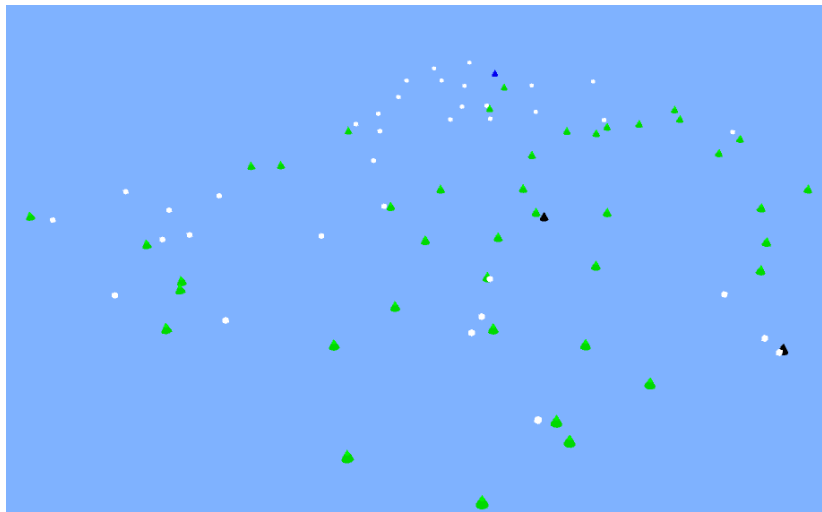- 3D spatial simulation
- Physical simulation

Why breve?

- Easy way to visualise a simulation (and to disable it)
- Framework
- Open Source / Free to use
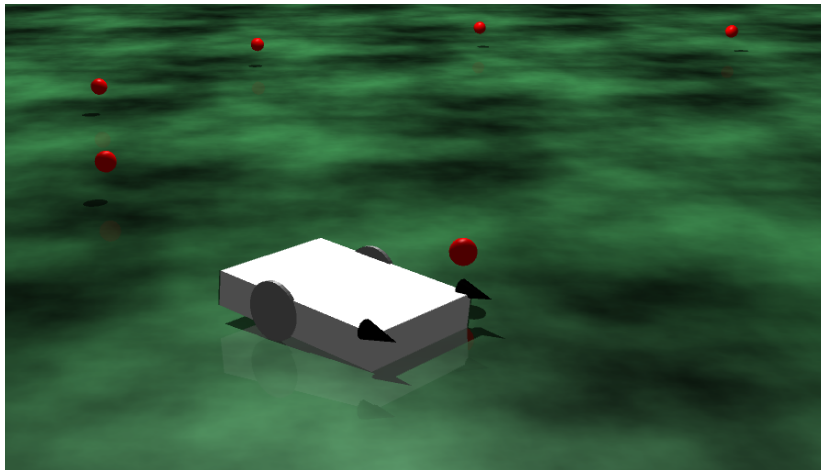
The evolution of leadership

Wouter Bulten, Robert-Jan Drenth & Lysanne Sloff

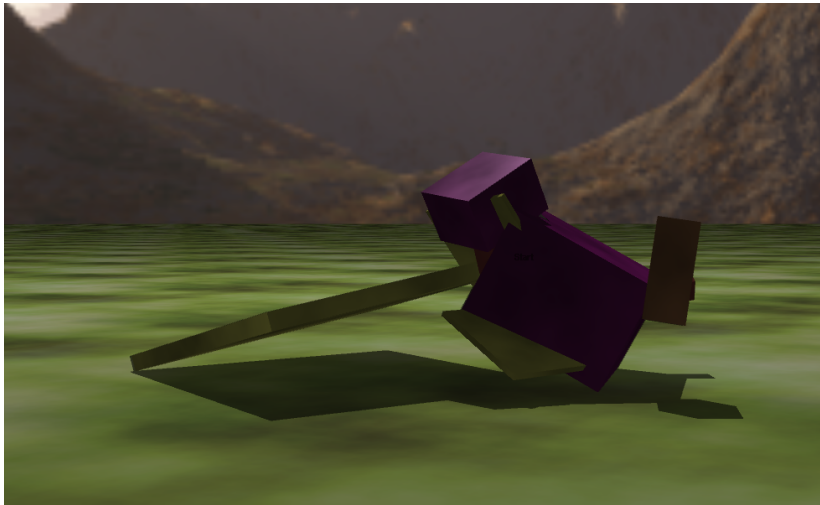# Punishment Mechanisms and their Effect on Cooperation

Mike Farjam, Pim Haselager & Ida Sprinkhuizen-Kuyper, BNAIC 2012
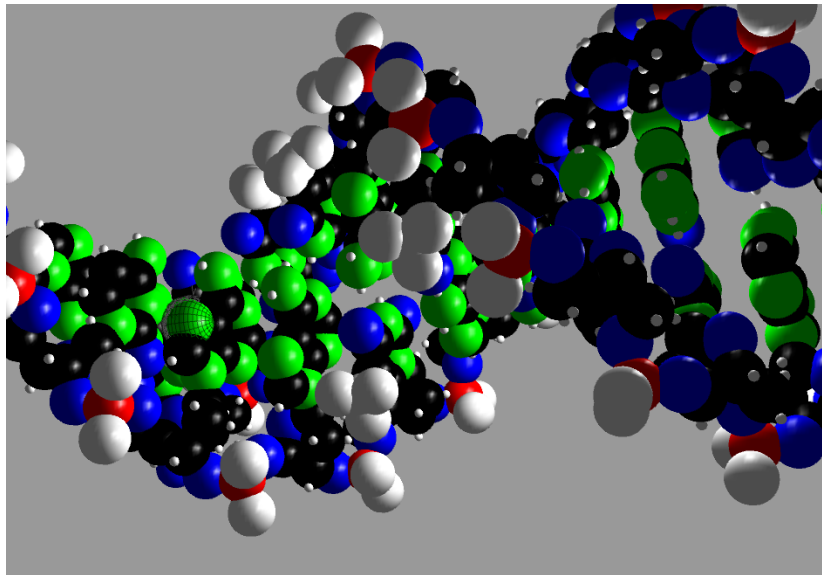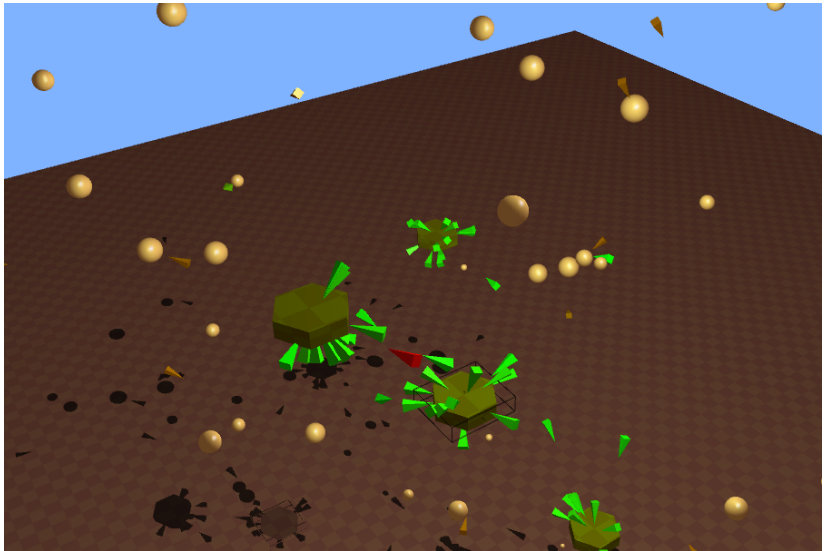
Braitenberg

Virtual Creatures

Evolving virtual creatures, Sims (1994)

Molecule

Sharing eco-system

Wouter Bulten, Pim Haselager & Ida Sprinkhuizen-Kuyper, BNAIC 2012

Basis of a simulation

Every simulation has the same building blocks:

1. Controller
2. Agents
3. Objects (floor, food, nests, etc.)

Building & running a simulation

- Build simulations in Steve or Python
- Run using the IDE or through command line

Steve

```
Mobile : Bird (aka Birds) {

+ to init:
...

+ to iterate:
...
}
```

Python

```
class Bird( breve.Mobile ):

        def __init__( self ):
            ...

        def iterate( self ):
            ...
```

Adding complexity

- Communication between
  - agents (groups, leaders, followers)
  - simulations via a network
- Use physics
- Add evolution/genetics (own modules, link with JGap, or built-in engine Push)

What we are going to build

- 3D decentralised food gathering algorithm
- No communication between agents
- Goal: collect food and make piles
- Optional: two groups