

BlenderAI : Artificial Intelligence in Blender

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Blender Project Development

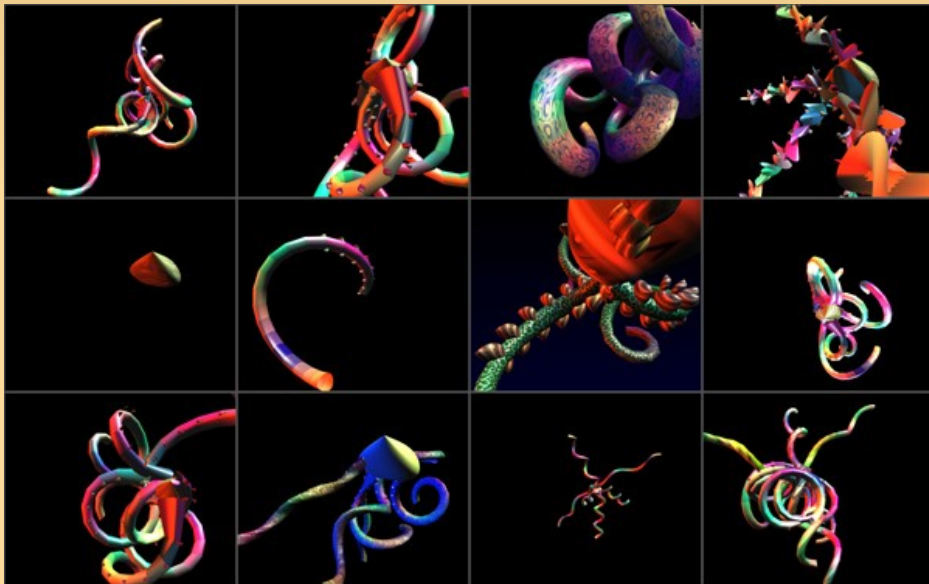


Goals of this project

- Using some AI Tools for 3D creation
- Using these same Tools for the Game Engine
- A generic framework for searching new method for creating textures, shaders, 3D objects, character animations , etc.
- Make Blender, the first 3D creation suite to include some Genetic Tools, Neural Network Tools, etc.

Where this idea come from ?

- The pioneers in this field were :



★ Richard Dawkins

★ Karl Sims

(see video)

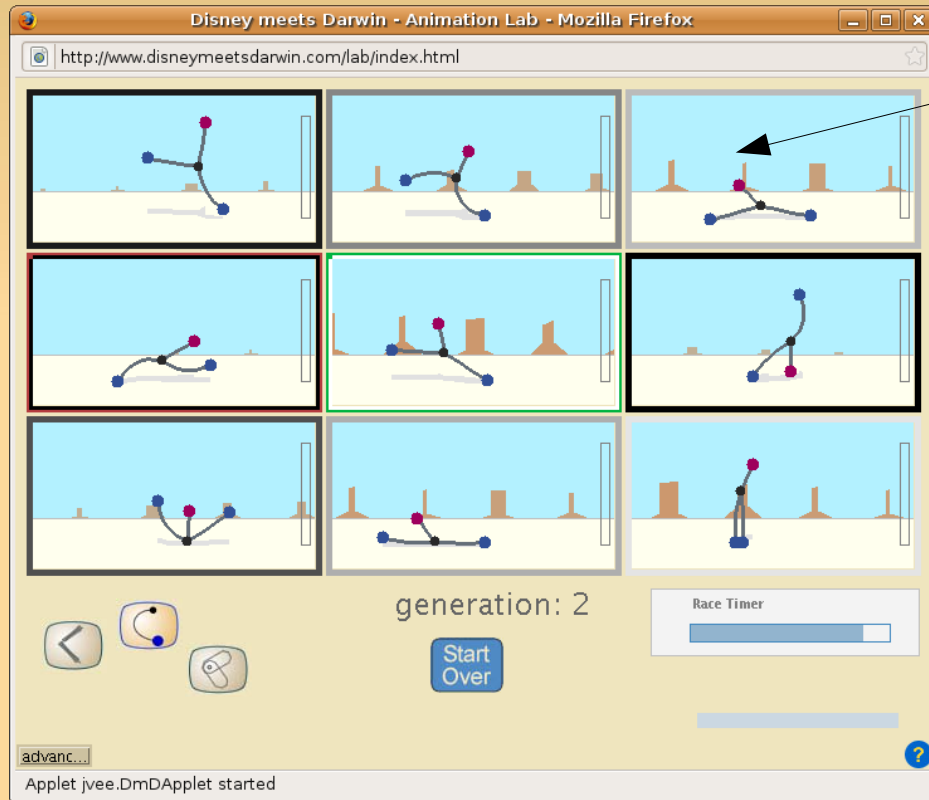
★ William Latham

★ Michel Bret

★ Steven Rooke

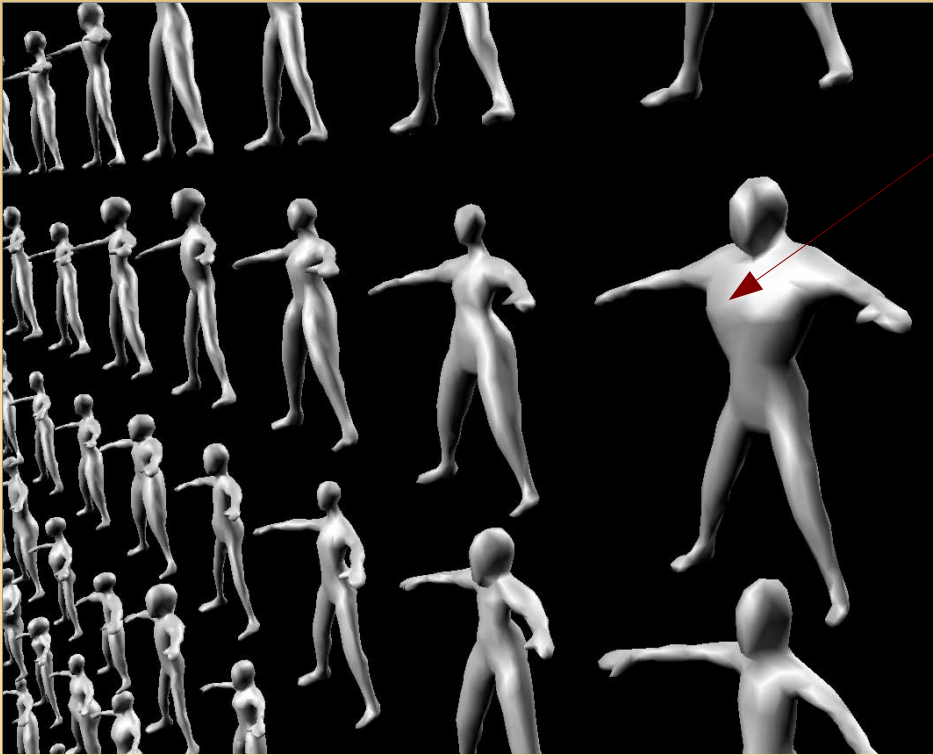
★ etc...

Research for 3D animation and AI



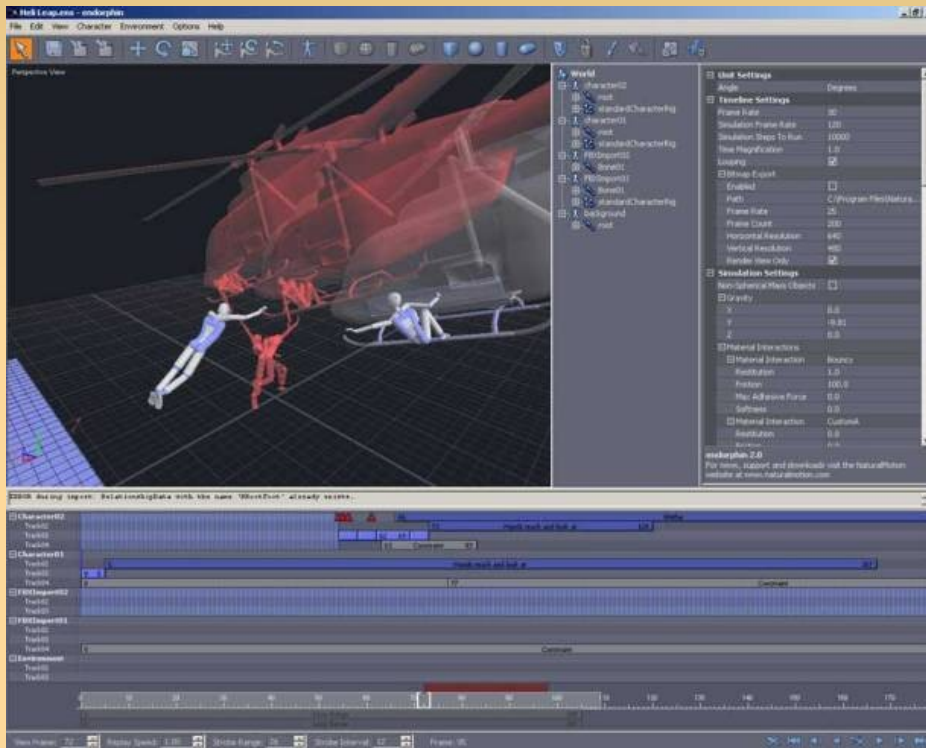
- Larry Gritz
http://www.icg.gwu.edu/publication_paper.htm
- Jeffrey Ventrella
<http://www.ventrella.com/>
- Matthew Lewis
<http://accad.osu.edu/~mlewis/>
- Michiel Van de Panne
<http://www.cs.ubc.ca/~van/>
- Craig Reynolds
<http://www.red3d.com/cwr/>
- Many others ...

Some of the best applications...



- **Disney Meets Darwin**
(+ Demo)
- **Metavolve**
- **Sensor Actuator Networks**
- **Nevar** (Penousal Machado)
<http://eden.dei.uc.pt/~machado/>
- ...

...Endorphin



- The first 3D commercial software with AI techniques
- Based on the Torsten Reil(*) Thesis.

<http://www.naturalmotion.com/endorphin.htm>

- (*) If you can find this thesis , please tell me !

+ <http://www.craftanimations.com> : New plugs for 3D Softwares

Endorphin : Technology

- Based on research on the neural basis of animal and human locomotion, carried out at Oxford's Department of Zoology, Torsten Reil, Colm Massey and Dr David Raubenheimer have founded NaturalMotion as a means to commercialise their results.
- NaturalMotion's technology employs virtual brains (neural networks) to control physical simulations of real humans. The system works by artificially evolving the parameters of the neural network to make it perform particular tasks, such as walking or swimming. 'Basically, we start out with a rag doll' explains Torsten Reil, co-founder and Executive Director. 'We then add muscles and a brain to the thing. That's where it becomes interesting.'
- (See Video Demo of Endorphin)
 - + look also at Ik Soo Lim works : <http://ligwww.epfl.ch/~lis/>

The future for 3D creation softwares

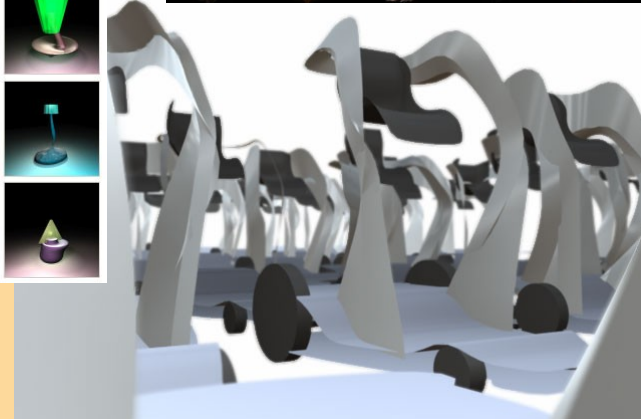
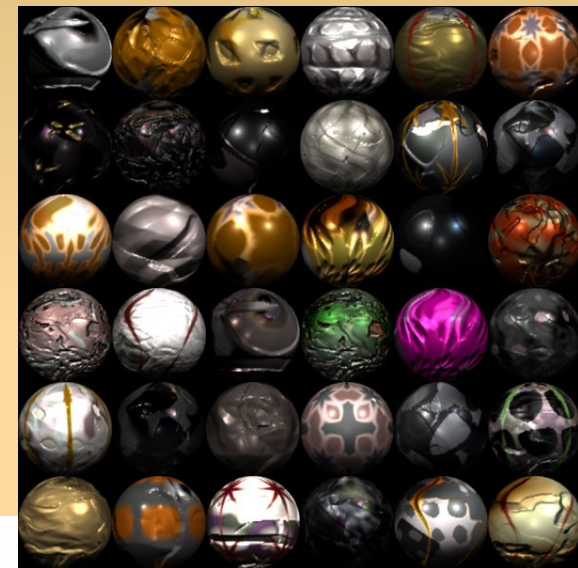
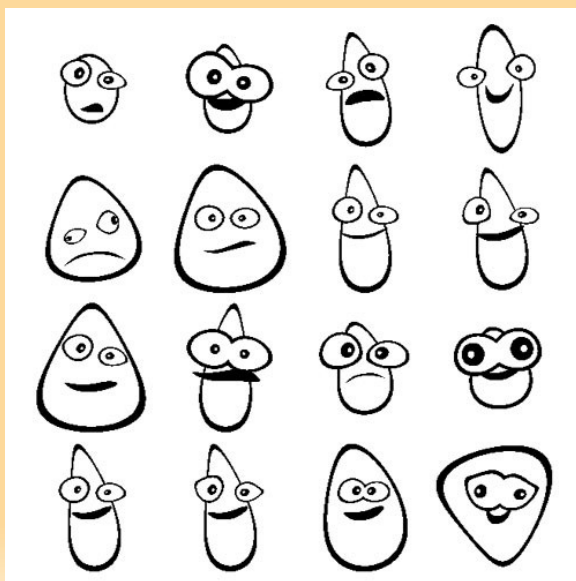
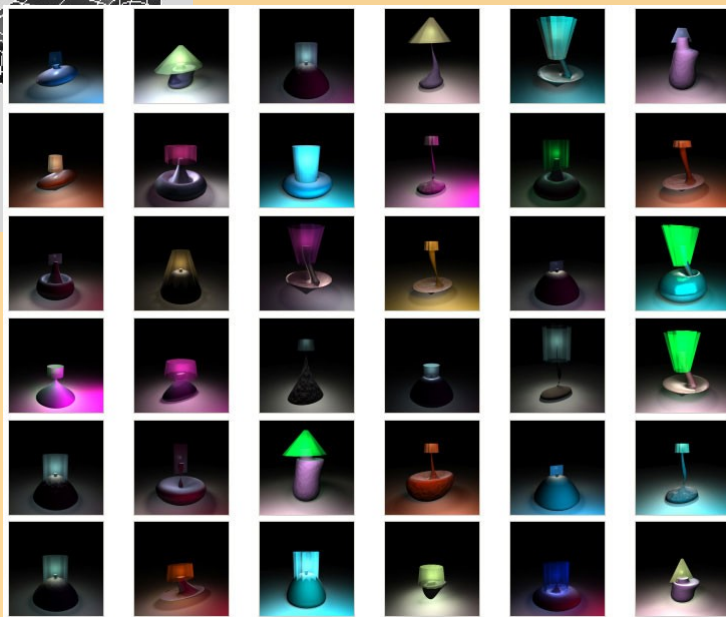
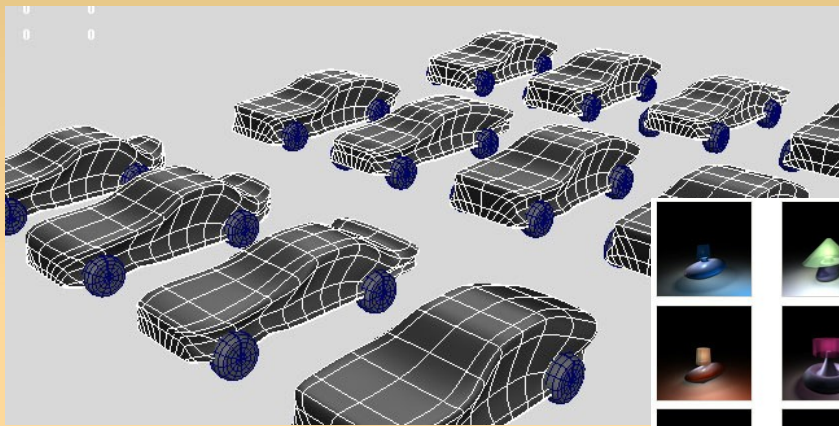
- Blender would be the first 3D creation suite (modeling, texturing, animation, rendering) including some modules based on optimization techniques, machine learning and solution research, using Genetic Algorithms, Genetic Programming, Neural Networks, Self Organizing Map, Bayesian Networks, Fuzzy Logic and Principal Component Analysis.

Applications in Blender :

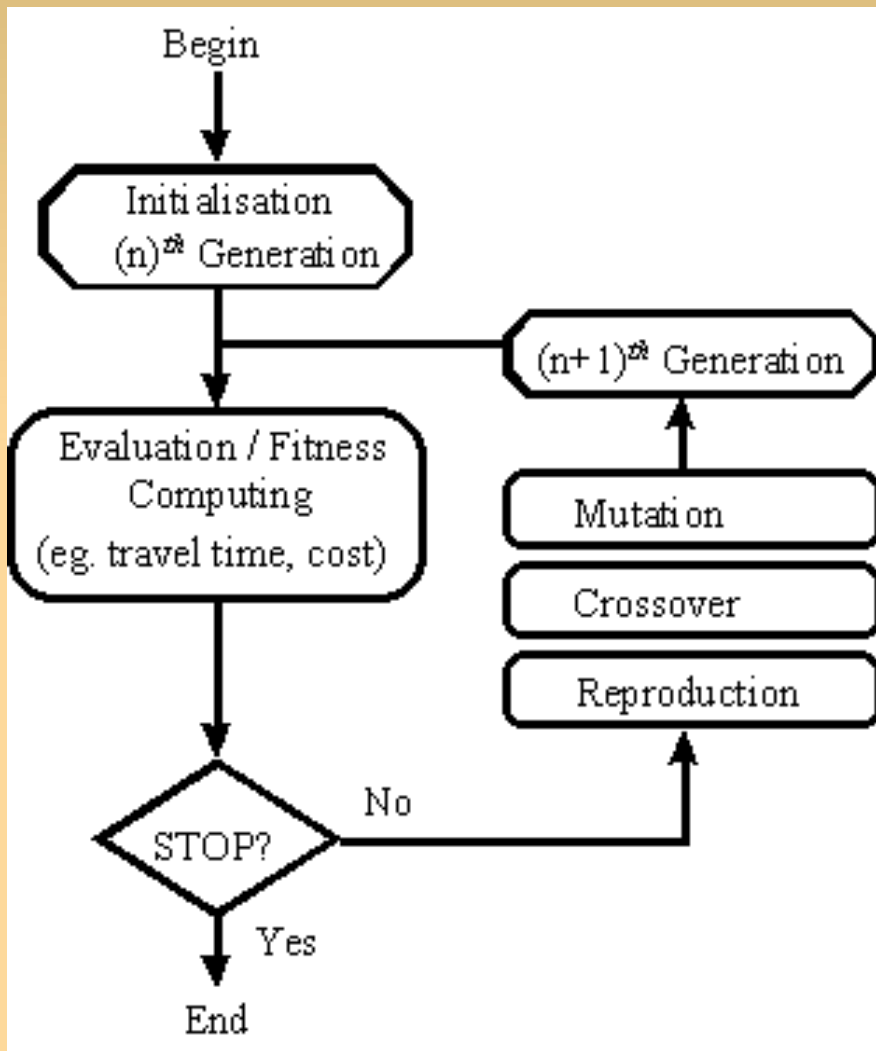
- Searching new textures
- Searching new 3D models
- Searching new styles for animated figures
- Machine Learning and complex set of parameters research
- Generative Animation
- Searching for new shaders
- Searching for complex parameters for rendering
- Generative Art
- etc.

Many applications...

- See examples by Matthew Lewis (videos)

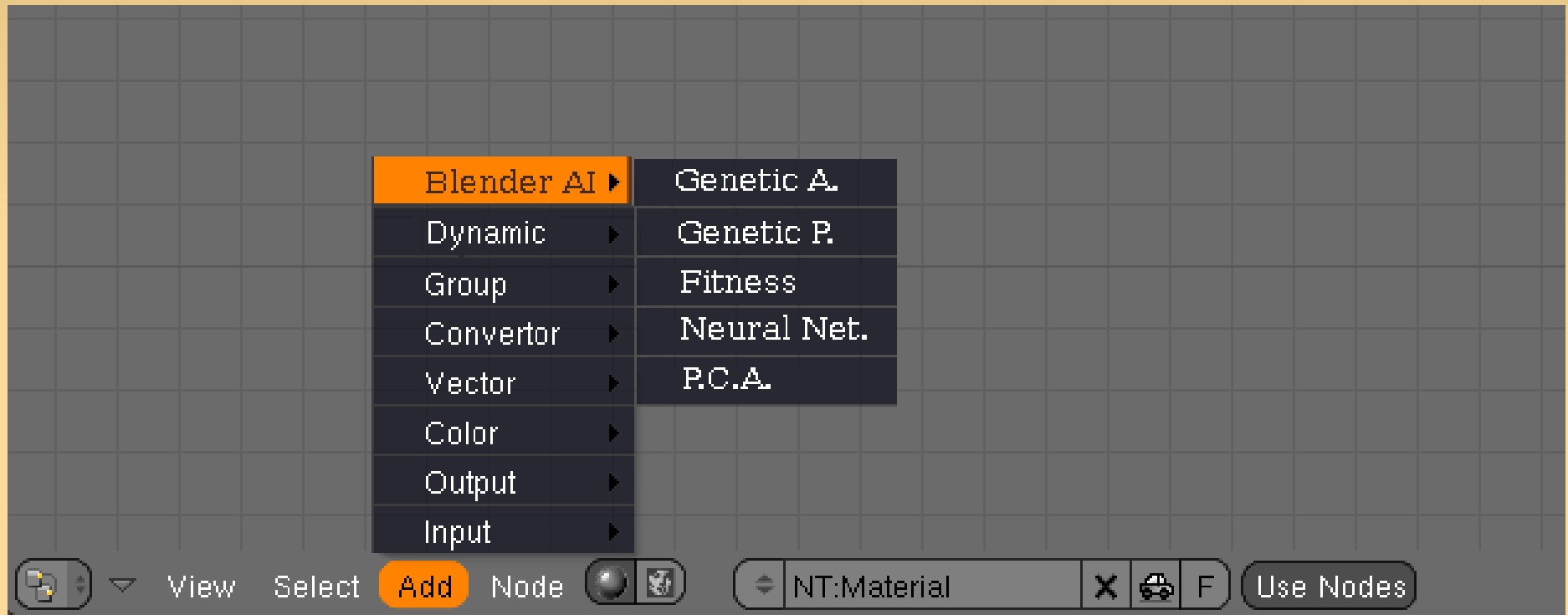


Integration in Blender

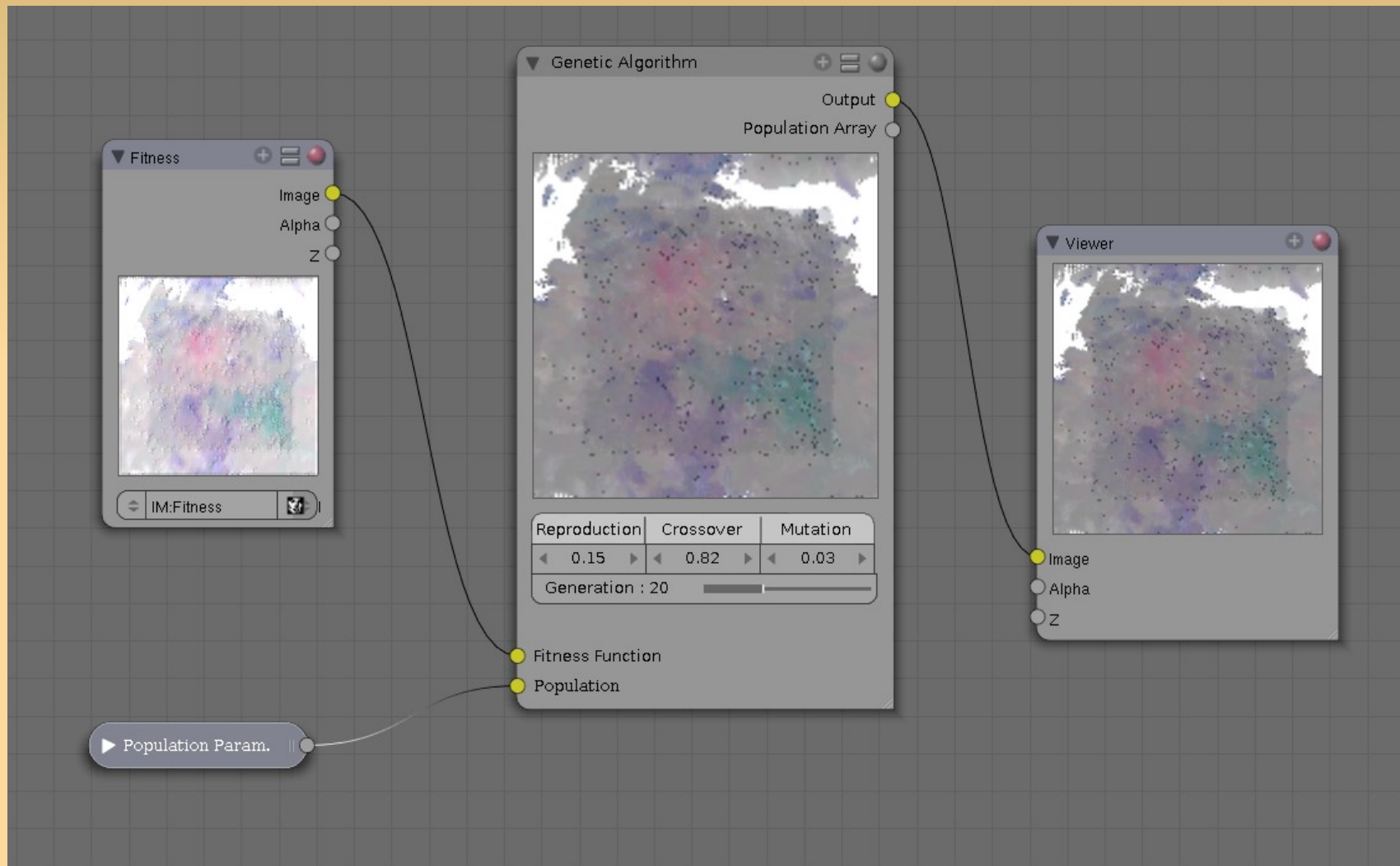


- 1 : A Genetic Algorithm module
 - ★ As a new Node in the Node Editor
 - ★ As a new Controller in the Game Engine
- See : http://en.wikipedia.org/wiki/Genetic_algorithm

New Nodes in the Node Editor



Genetic Algorithm in the Node Editor



Some free libraries in C++

- **EO** : <http://eodev.sourceforge.net/>
- **EvoCosm** :
<http://www.coyotegulch.com/products/libevocosm/index.html>
- **Open Beagle** : <http://beagle.gel.ulaval.ca/>

And some in Python :

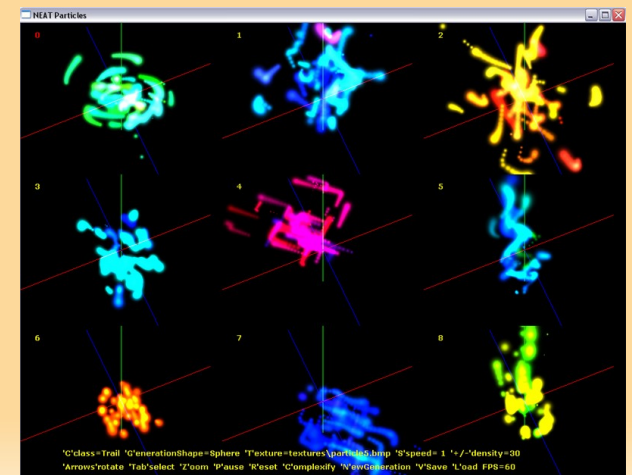
- **PyGene** : <http://www.freenet.org.nz/python/pygene/>
- **Genetic** : <http://home.gna.org/oomadness/en/genetic/>

Some existing tools

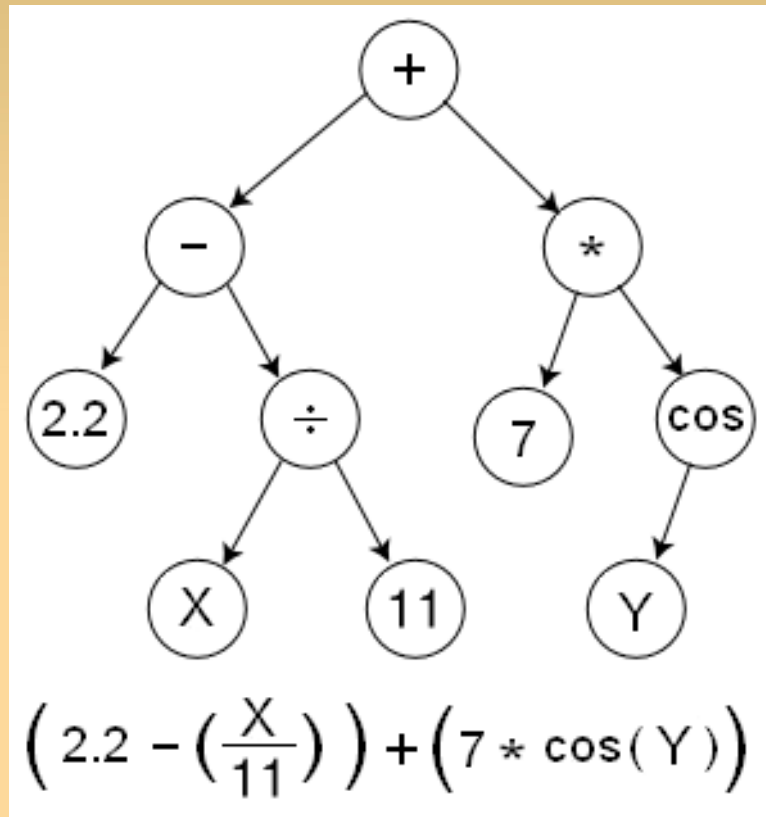
- **Kandid** : <http://kandid.sourceforge.net/index.html> (+ Demo)
- **Texture Maker (Gentex)** :
<http://www.texturemaker.com/help/modules/GenTex.htm>
- **Cybertation** (see Demo with Wine)
- **Evolvo** (see demo)
- **Blind WatchMaker** (see Demo with Wine)
- Etc. (many more, see for example, Matthew Lewis list :
<http://accad.osu.edu/~mlewis/aed.html>)

Other great applications...

- Particles : NEAT : http://en.wikipedia.org/wiki/NEAT_Particles
- Ecosystems : <http://www.pikiproductions.com/rui/xtnz/index.html>
- Lsystems :
<http://www.simonyi.ox.ac.uk/dawkins/software/yan/L-Breeder/>
- 3D Sculptures : <http://www.xs4all.nl/~notnot/breed/Breed.html>
- Plants, Swarms : EVOLVICA
<http://www.swarm-design.org/>
- Etc...



+ Genetic Programming Module



- Same as the GA, but with Functions Trees.
- See :
http://en.wikipedia.org/wiki/Genetic_programming
- Same methods :
 - ★ Reproduction
 - ★ Crossover
 - ★ Mutation

Some Libraries and Tools...

- Open Beagle (again) (C++)

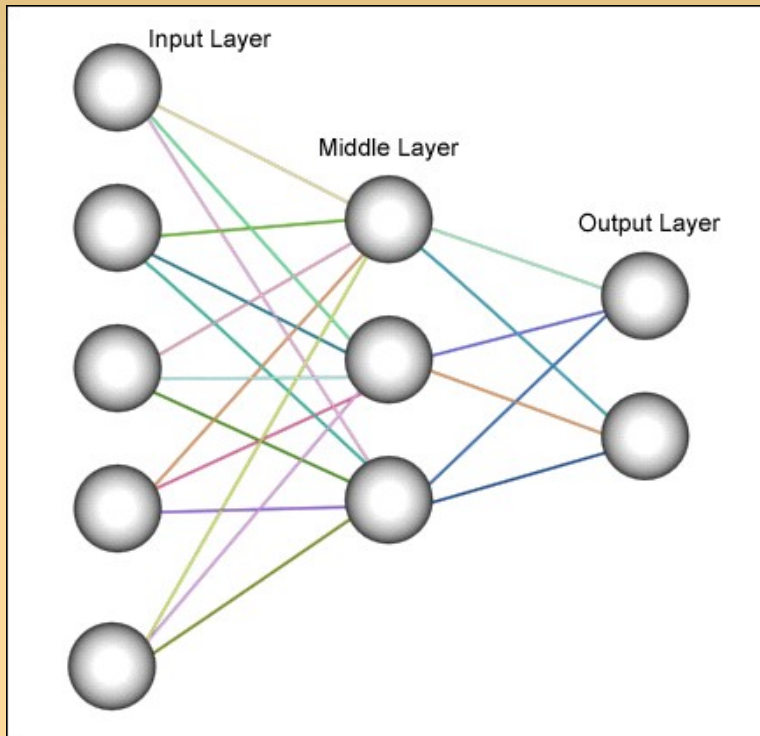
- PyGP (Python) :

<http://pygp.sourceforge.net/>

- Look at the good work of Larry Gritz (ex Pixar) (animating Luxo Jr with GP. See PDF docs)



+ Neural Network Engine



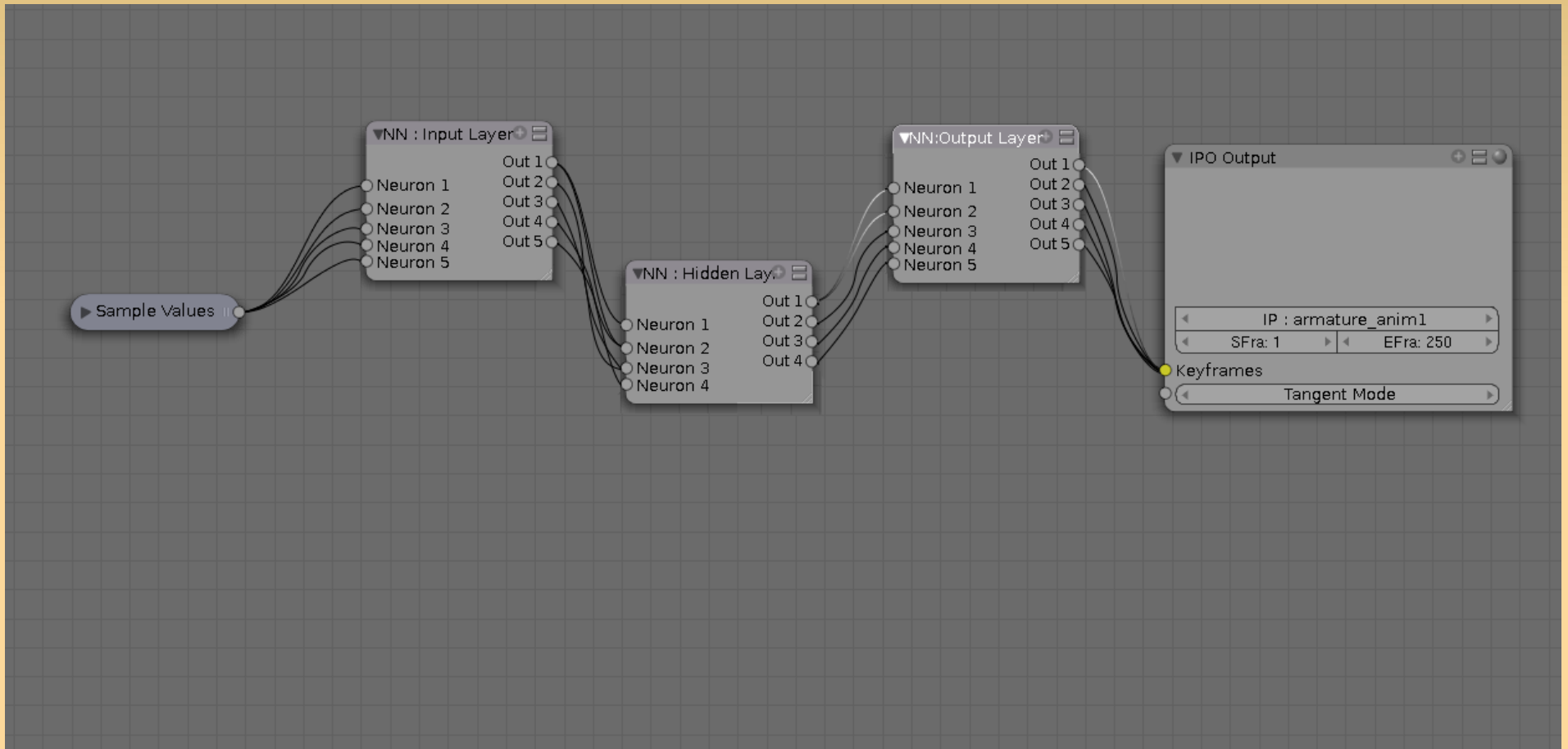
- Feedforward neural network
- Kohonen self-organizing map (SOM)
- Hopfield Networks
- etc.
- See :

http://en.wikipedia.org/wiki/Artificial_neural_network

Some free libraries...

- FANN : <http://leenissen.dk/fann/> (C++)
- FFNET : <http://ffnet.sourceforge.net/> (Python)
- SOM (Kohonen) :
<http://www.len.ro/2007/01/som-neural-networks/>
(Python)
- etc.

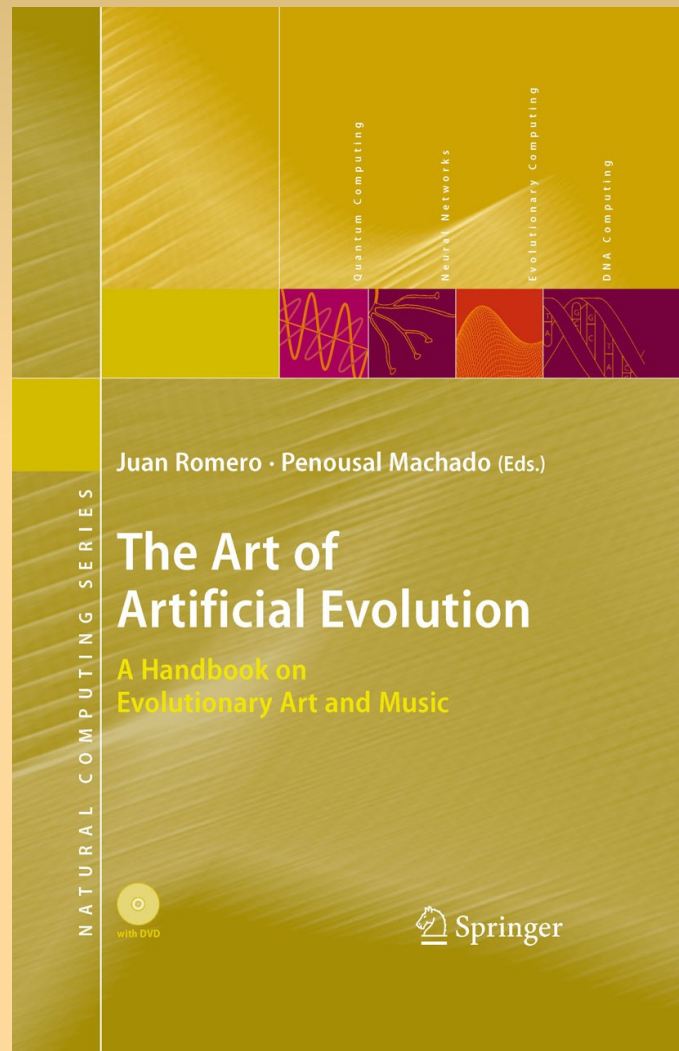
Neural Network in Blender



Other Tools in BlenderAI

- Fuzzy Logic :
http://en.wikipedia.org/wiki/Fuzzy_logic

The good books...



- The Blind Watchmaker (R. Dawkins)
- The Art of Artificial Evolution : A Handbook on Evolutionary Art and Music . Springer Berlin Heidelberg. 2007
- Evolutionary Art and Computers, W Latham, S Todd, 1992, Academic Press
- MetaCreation. Art and Artificial Life. Mitchell Whitelaw. MIT Press.
- Many Books from Peter J.Bentley : <http://www.peterjbentley.com/>
- Emergence de Nouvelles Esthétiques du Mouvement. Alain Lioret. L'Harmattan. 2004. France. (in French)
(with the GaBuZoR System, including some experimental modules before developping BlenderAI).

Need Blender Developers...

- Please, contact alainlioret@wanadoo.fr

