Generative Art using Neural Networks

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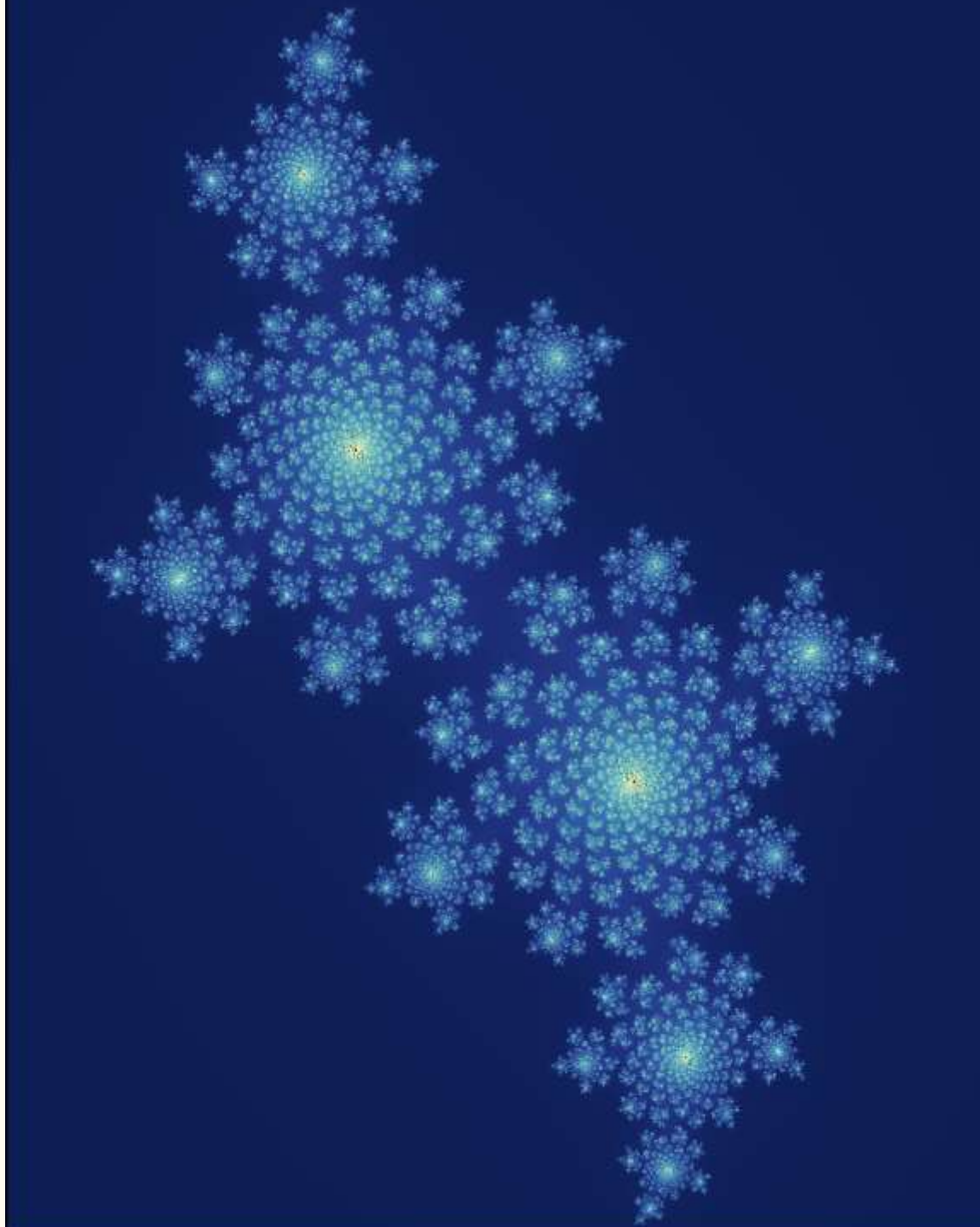


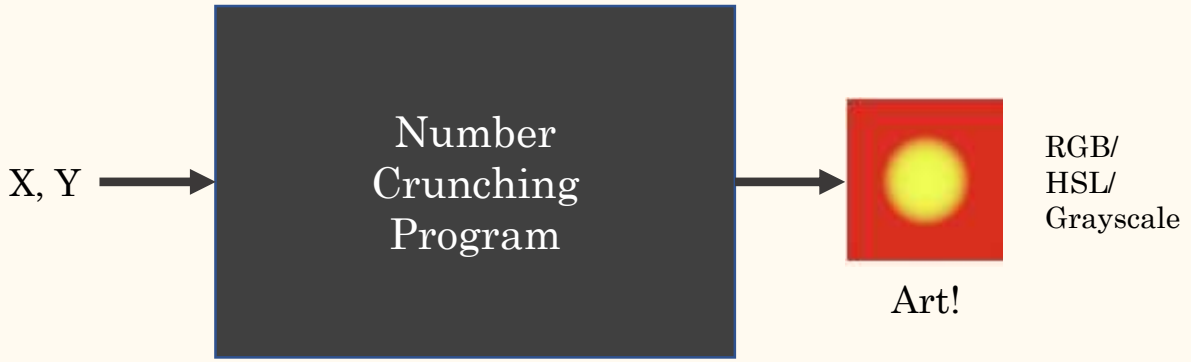
Creative Coding

- SVG or CSS Art
- Generative Art
- Art using Machine Learning/Deep Learning techniques

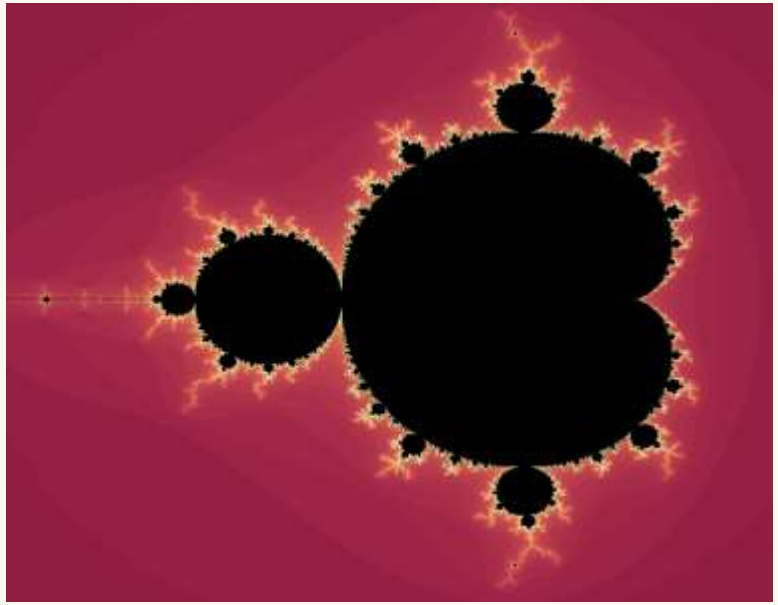
What is Generative Art?

Computer Program which produces art using –

- Some rules
- Certain degree of randomness or unpredictability

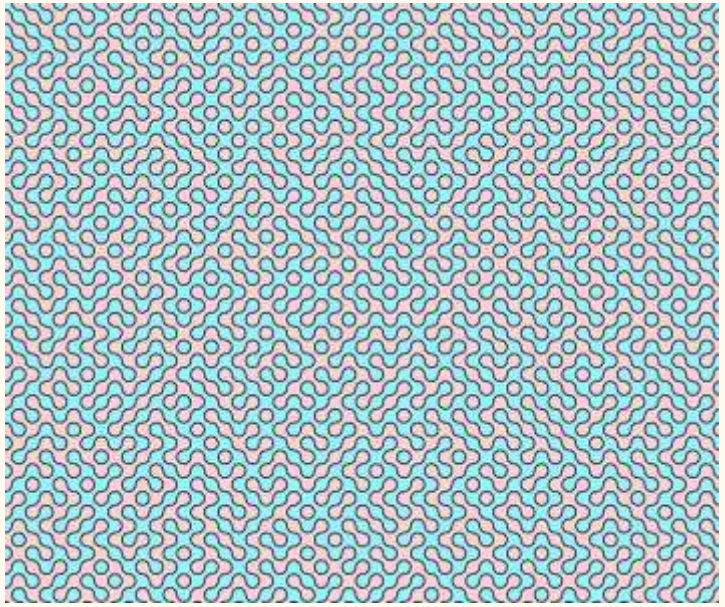


Examples



Mandelbrot set

Visualizing complex numbers that don't diverge



Truchet Tiling

Semi arcs with random rotations

Art of PI

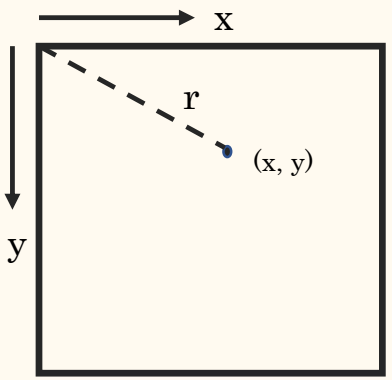
First 1600 digits

All examples live at https://pkamath2.github.io/code-gallery/

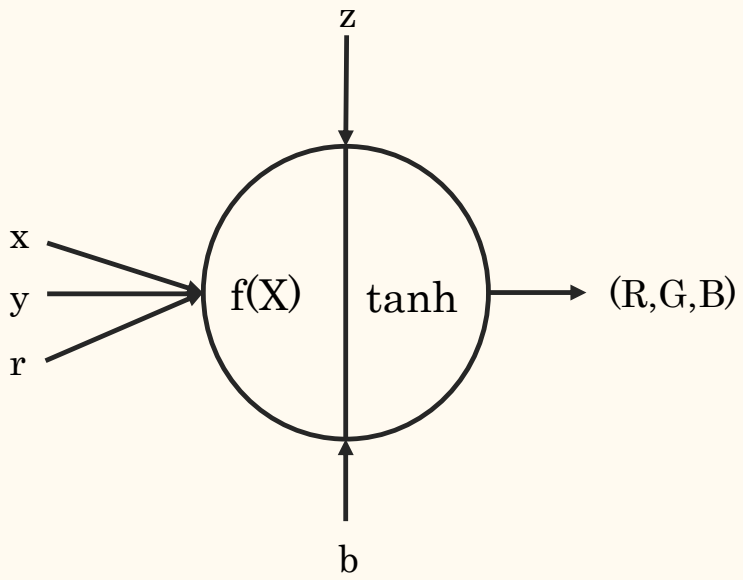
Generative Art using Neural Networks

Source: David Ha's blog at - http://blog.otoro.net/2016/03/25/generating-abstract-patterns-with-tensorflow/

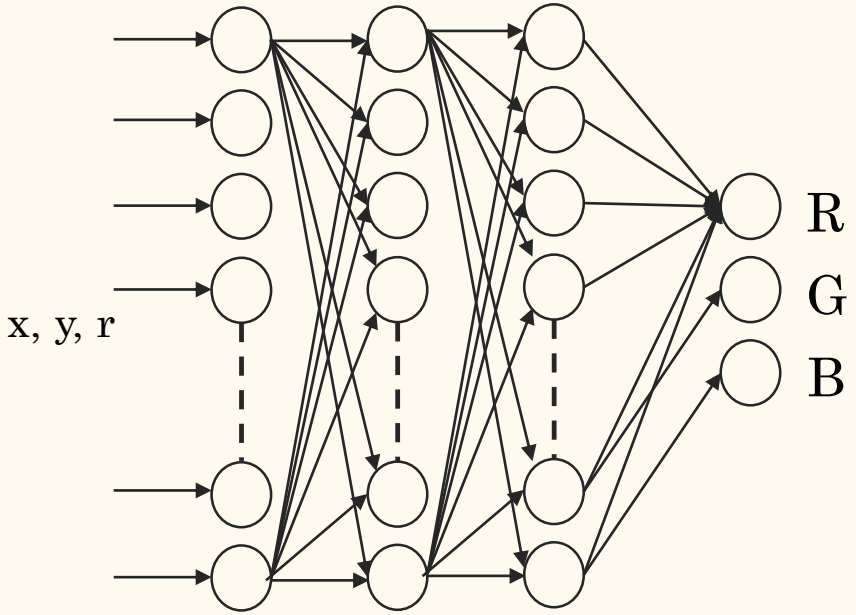
Generative Art using Neural Networks



Image/art to be created



Single neuron



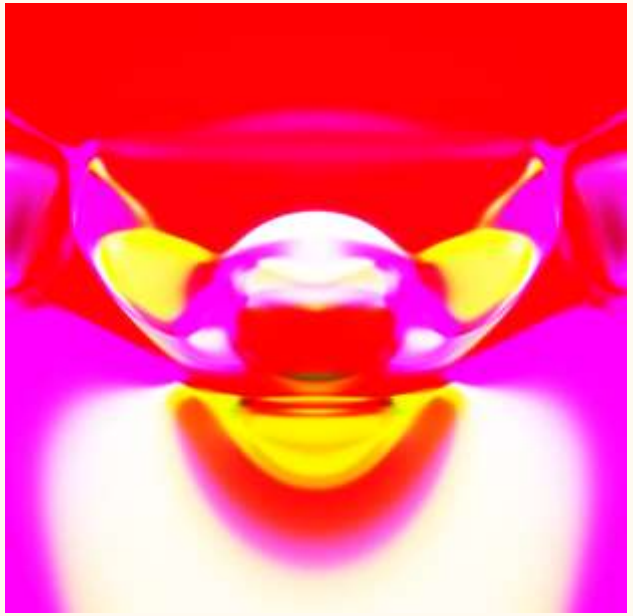
Fully connected network

Generative Art using Neural Networks

- These are called “Compositional Pattern Producing Networks” or CPPN for short.
- Term coined by Kenneth O. Stanley in a paper (see reference) in 2007

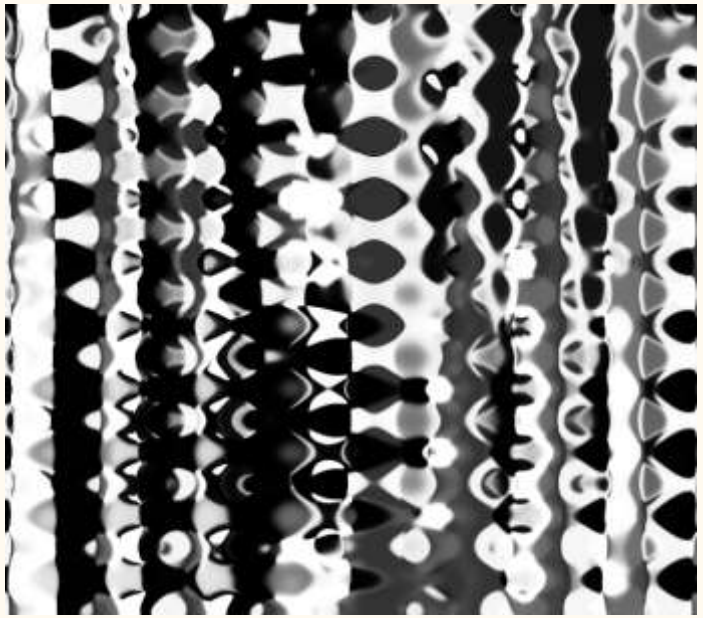
DEMO!

Generative Art using Neural Networks - DEMO



The Wasp

3 hidden layers ***tanh*** *activation*
Sigmoid *output*
Squared *input x*



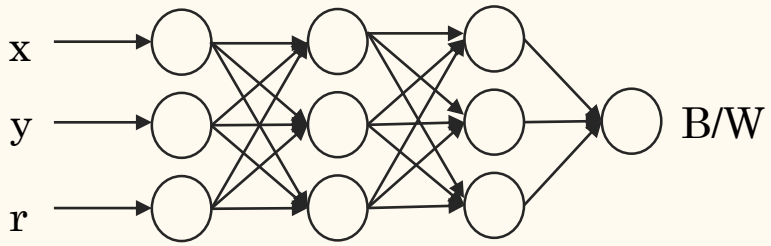
Batik Fractal

32 hidden layers ***tanh + relu*** *activation*
Sigmoid *output*
Periodic (sin) *x & y*

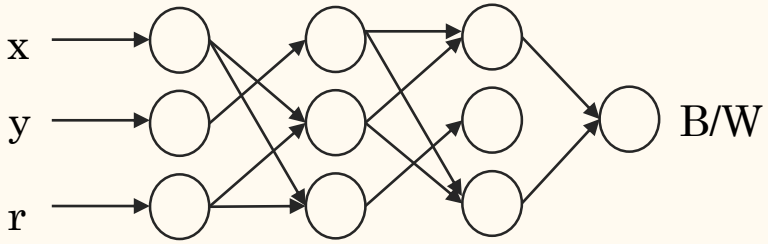
Can you see a face?

64 hidden layers ***tanh*** *activation*
Sigmoid *output*

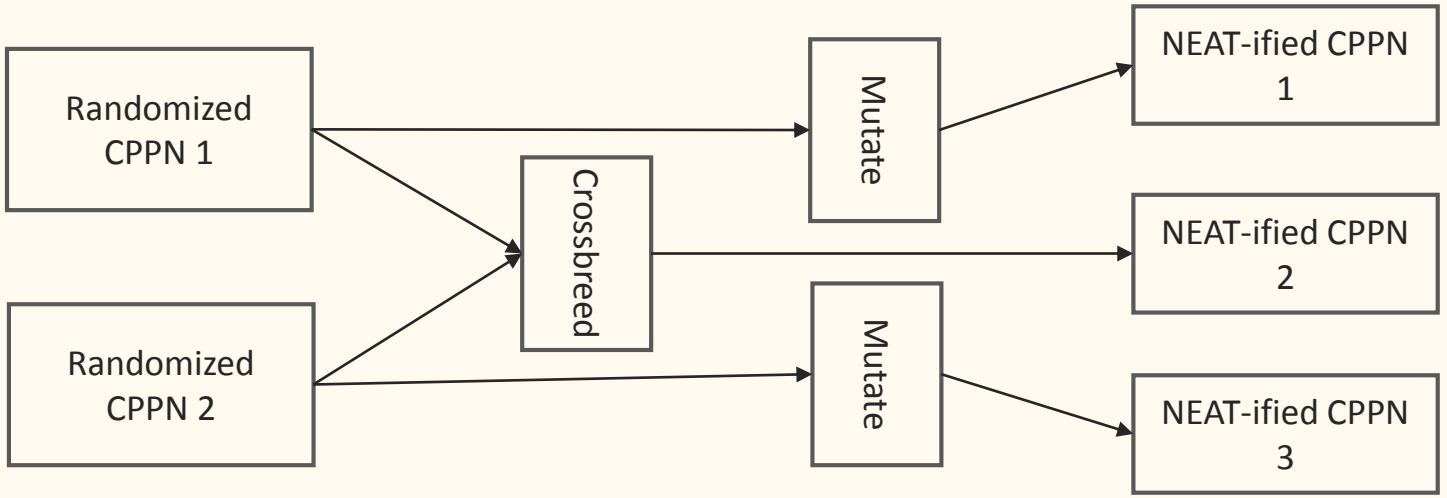
CPPN - Neuro Evolution Of Augmented Topologies



Simple CPPN

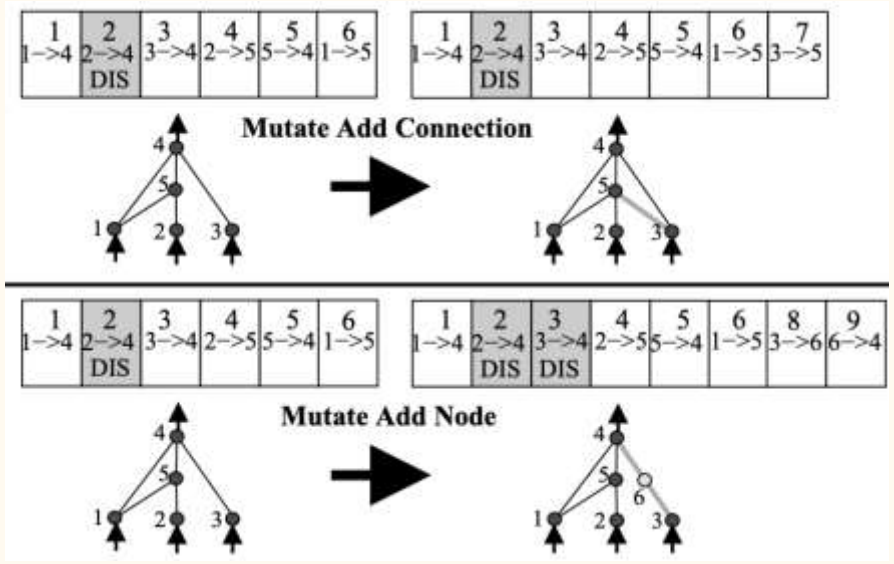


Randomized CPPN

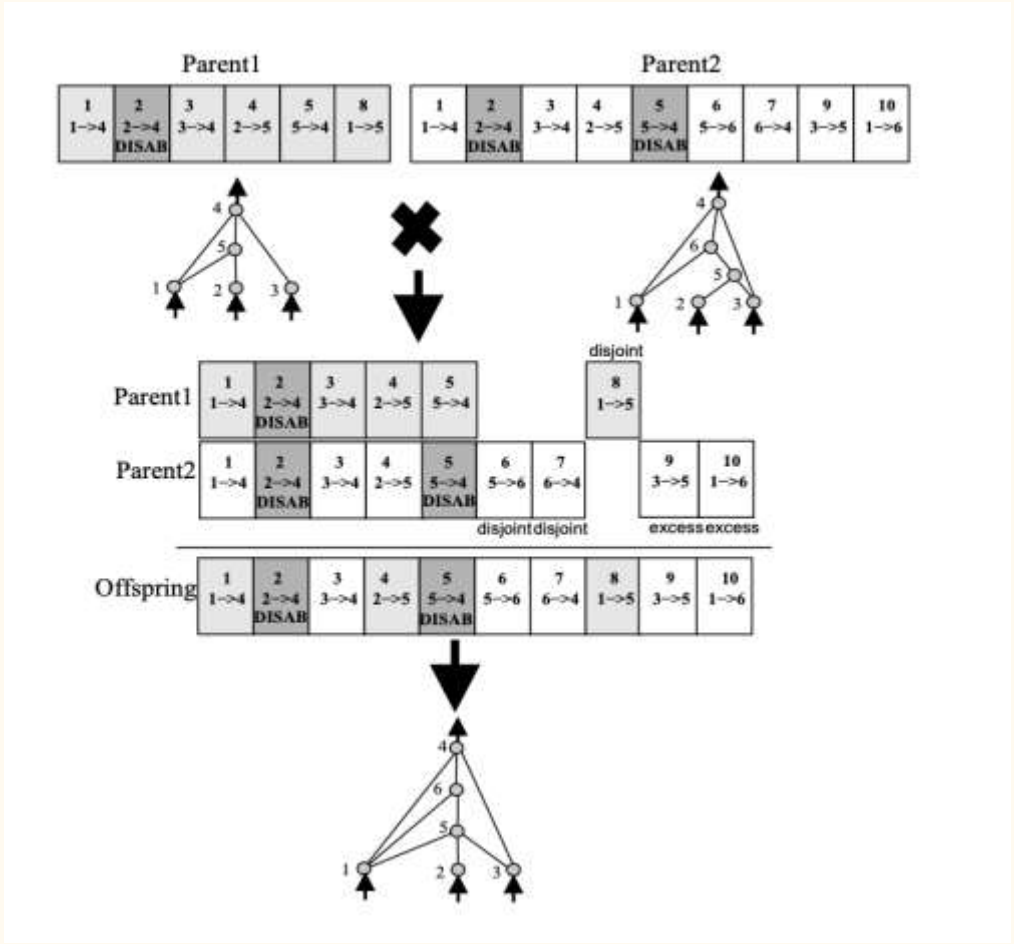


CPPN - Neuro Evolution Of Augmented Topologies

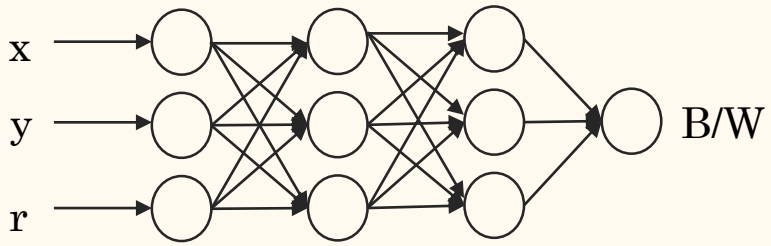
Mutation



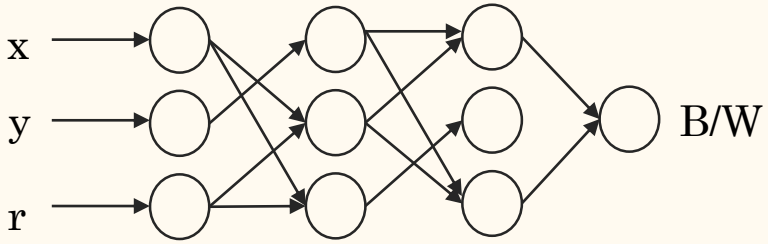
Cross breeding



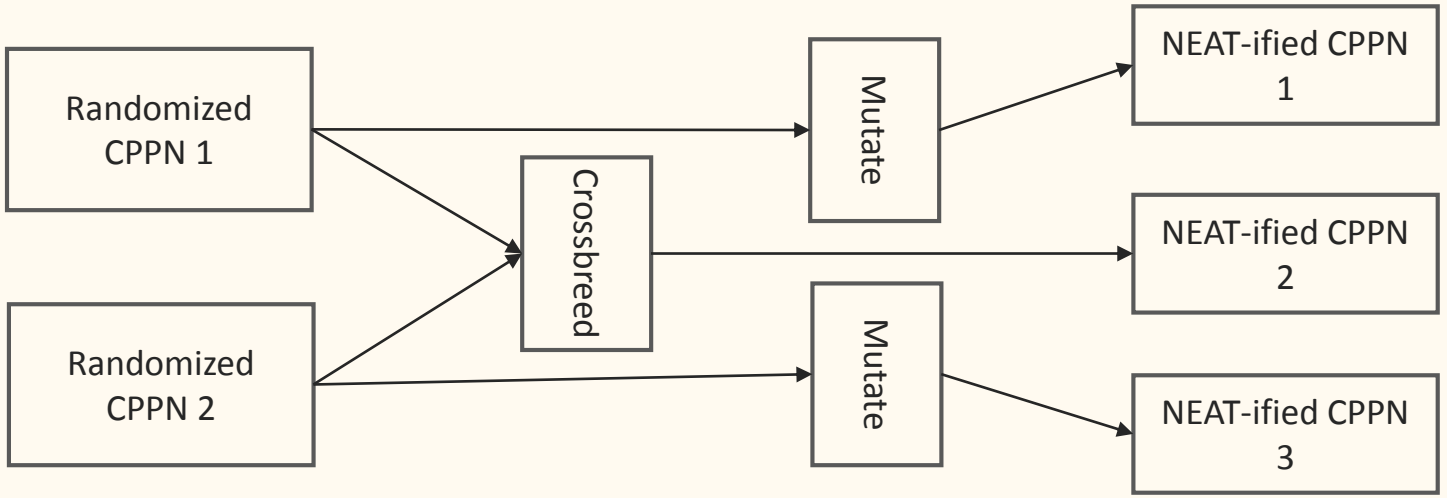
CPPN - Neuro Evolution Of Augmented Topologies



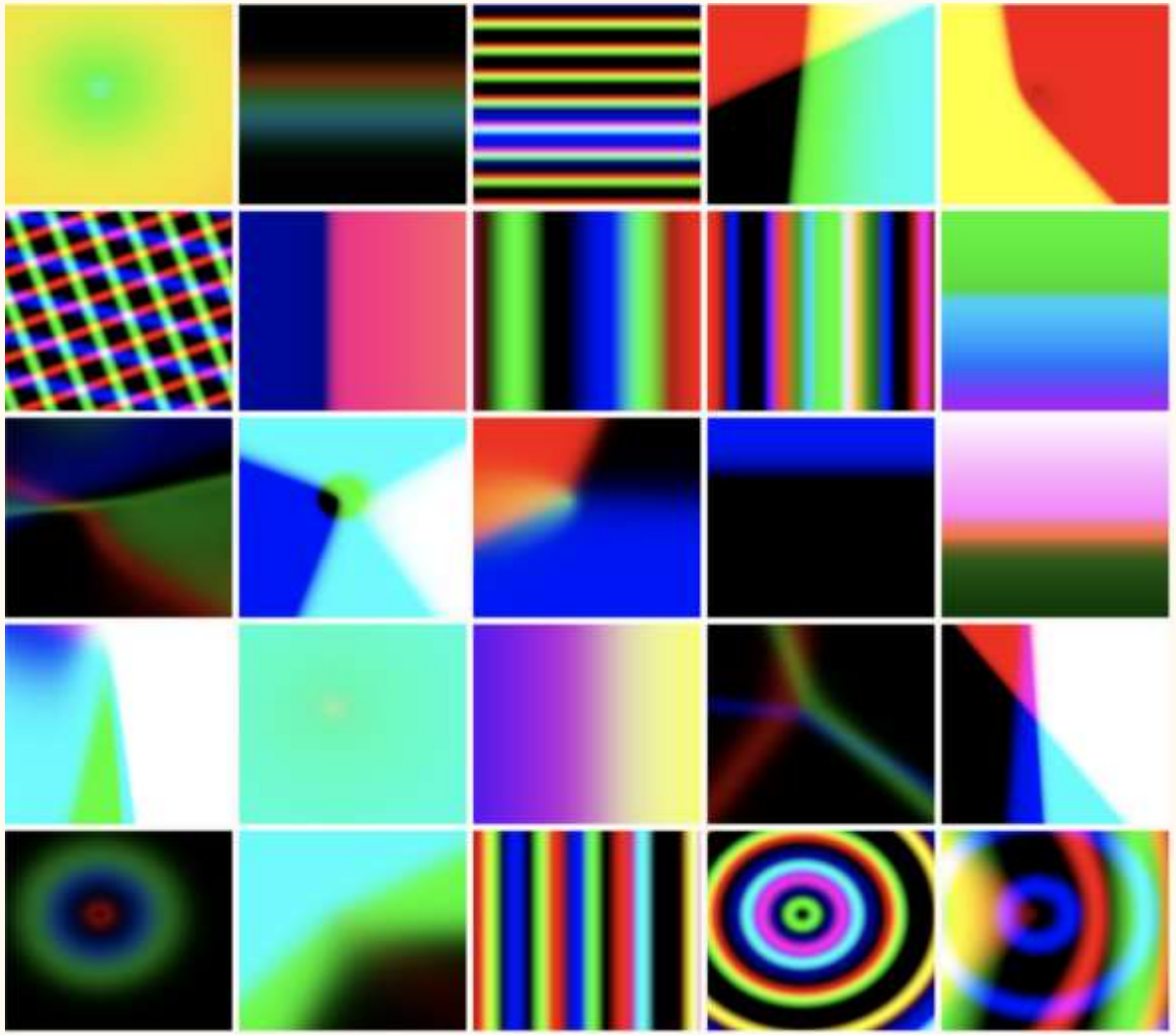
Simple CPPN



Randomized CPPN



My Own Picbreeder



- 25 Individual randomized CPPNs
- RGB or BW
- Ability to cross breed & mutate to generate more art work

DEMO!

Technology Selection

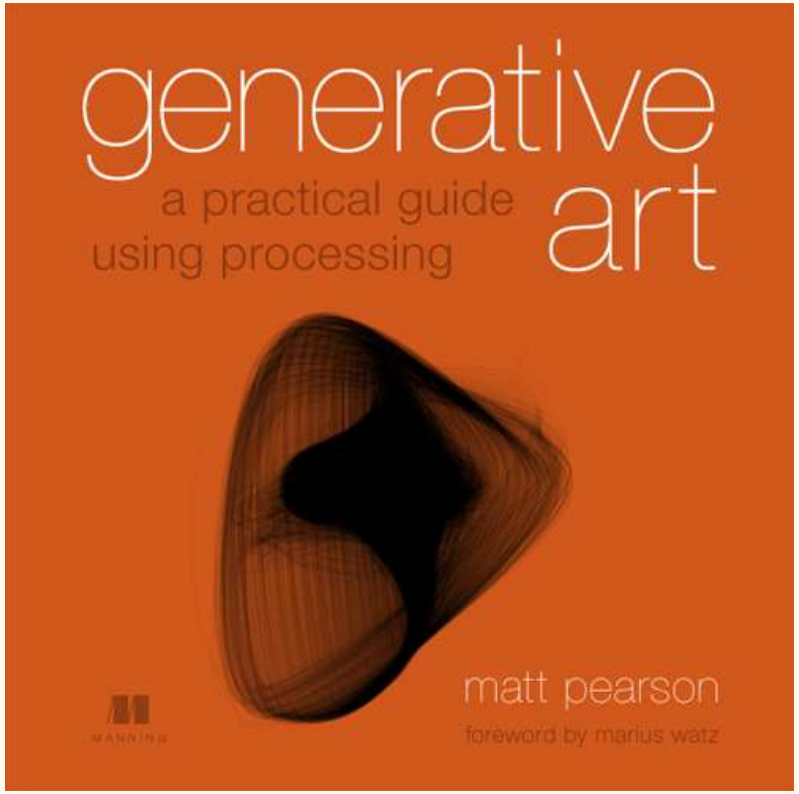
- Tensorflow.js (specifically tfjs-node for server side generation)
- Node.js
- HTML Canvas & PNG Streams
- D3 for network topology visualization

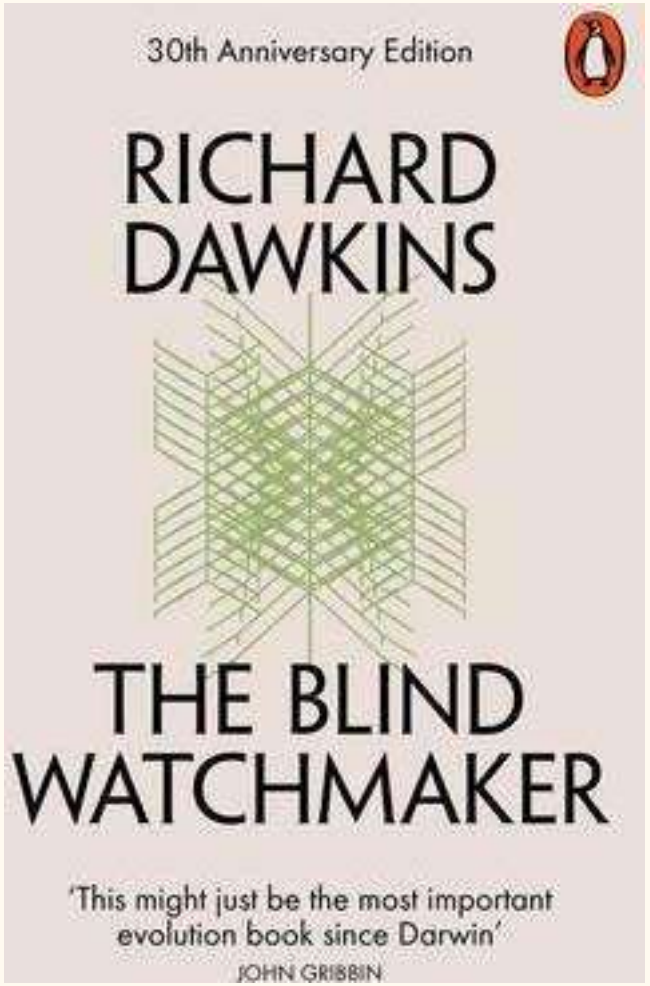
Source code: https://github.com/pkamath2/picbreeder-tf-node

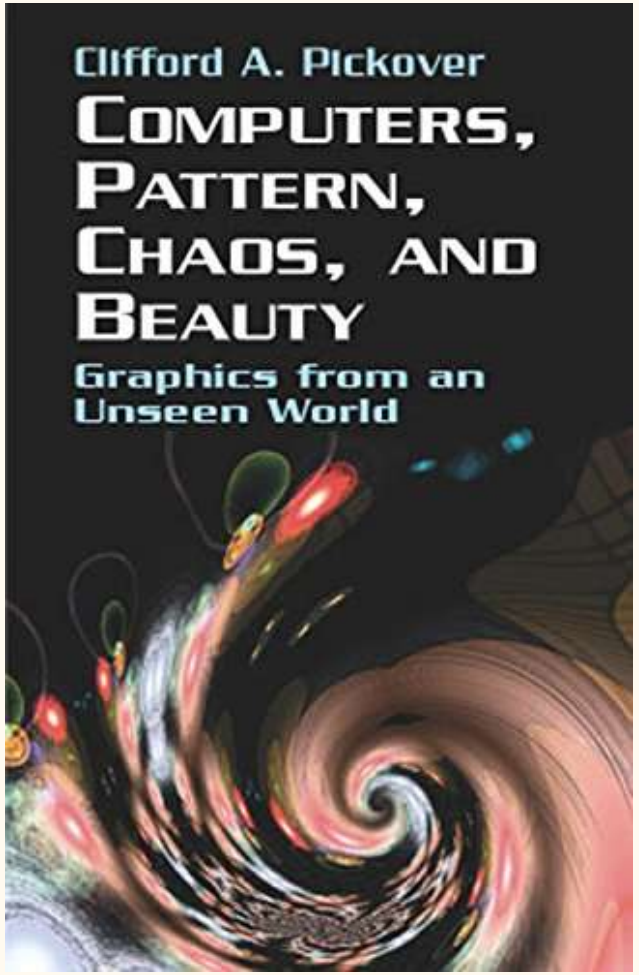
Next Steps

- Computational Complexity is high, since graph is internally maintained
- CPPN GANs!!!!!

Books


generative art
a practical guide using processing
matt pearson
foreword by marius watz


30th Anniversary Edition
RICHARD DAWKINS
THE BLIND WATCHMAKER
'This might just be the most important evolution book since Darwin'
JOHN GRIBBIN


Clifford A. Pickover
COMPUTERS, PATTERN, CHAOS, AND BEAUTY
Graphics from an Unseen World

References

- The original picbreeder – http://picbreeder.org
- My Blog: https://medium.com/@prnmkmth/generative-art-using-neural-networks-and-javascript-d2c353fb0574
- Abstract Patterns using Tensorflow: http://blog.otoro.net/2016/03/25/generating-abstract-patterns-with-tensorflow/
- What is Generative Art? - http://www.philipgalanter.com/downloads/ga2003_paper.pdf
- Compositional Pattern Producing Networks - https://eplex.cs.ucf.edu/papers/stanley_gpem07.pdf
- Evolving networks through augmented topologies - http://nn.cs.utexas.edu/downloads/papers/stanley.ec02.pdf

Thank you!

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