

Cyber-genetic Neo-Plasticism:

**An AI Program
Creating Mondrian-like Paintings
by Using Bacterial Evolution Algorithm**

**supervisor: Tom Gedeon
Student: Jian Yin Shen**

1. About art:

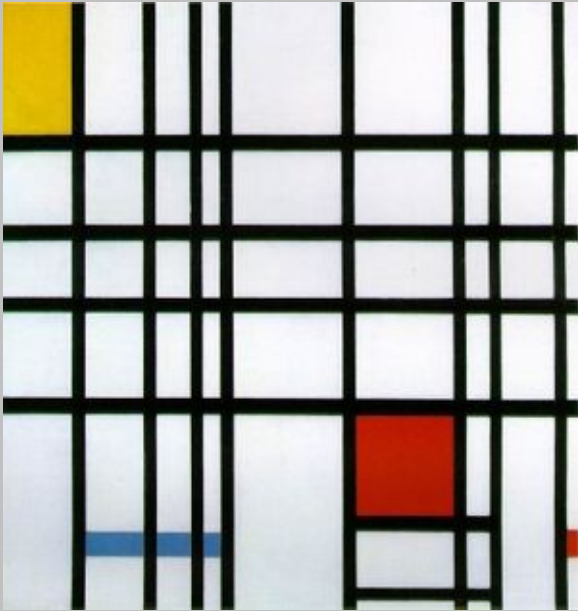
Piet Mondrian, and his NEO-PLASTICISM artworks



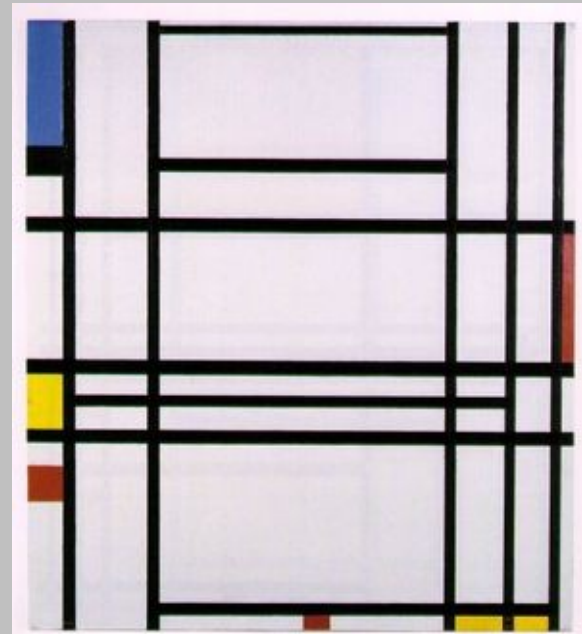
Piet Mondrian 1872 - 1944, Dutch painter
important contributor to De-Stijl (“the style” in English)

Neo-Plasticism: a famous faction of modern art

Famous paintings from Piet Mondrian:



Composition with Red, Yellow and Blue (1921). Oil on canvas. 72.5 x 69 cm.



Composition No. 10 (1939-42). Oil on canvas. 80 x 73 cm. Private collection

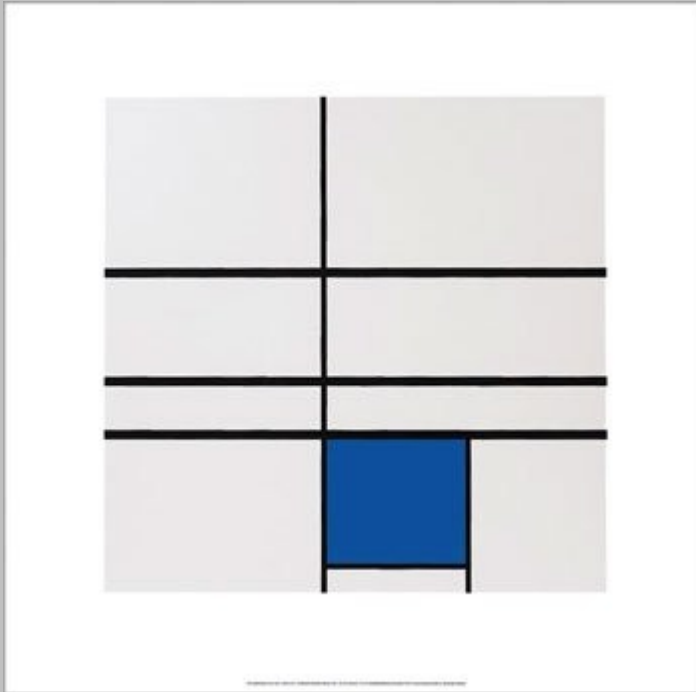
Characteristics of Neo-Plasticism:

1. Composed only by horizontal and vertical lines
2. Very simple color distribution: prime colors in rectangles
3. (domain of art) unknown rules of arrangement of simple elements that makes the painting aesthetic.

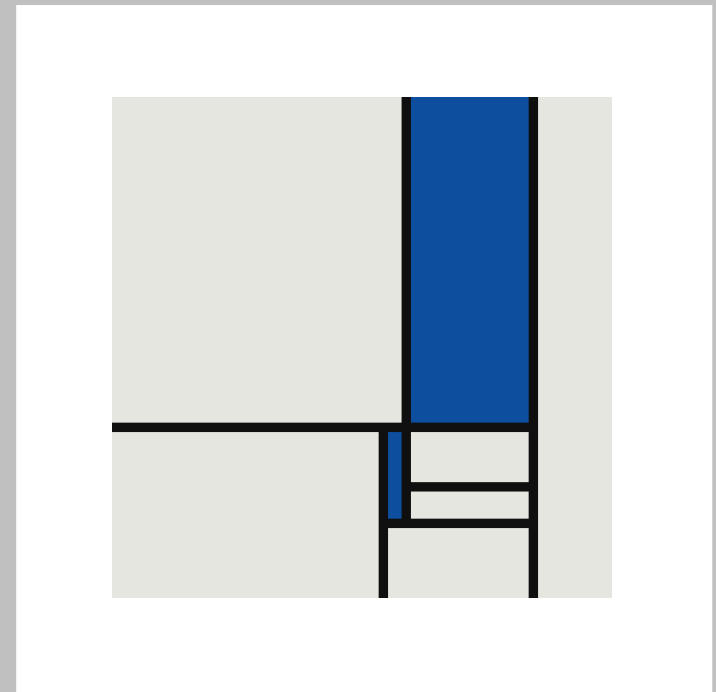
Target: simulate Neo-Plastic paintings

1. An algorithm that generates paintings strictly follows the rule of De Stijl (1, 2) - easy
2. Another algorithm that select aesthetic ones among those are generated at step 1. - hard

Results given:

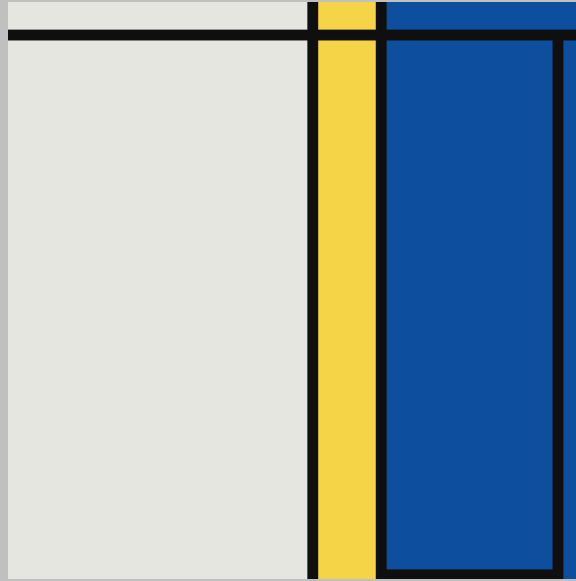
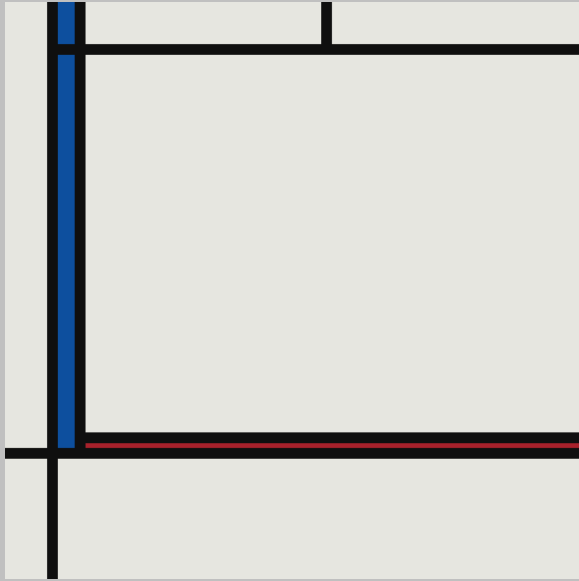


Composition with blue,
Oil on canvas, 1935
Piet Mondrian



Composition with blue,
JDK 5.0/SuSE Linux 10.1, 2006
Darwindrian prototype

Bad results:



.....

Problem:

Computer can give thousands of Mondrian-like paintings in 1 sec, how to extract the good ones?

Genetic Algorithm – a simulation of evolution in cyberspace

Darwin – Evolutionism:

A procedure that gives more chances of survival to those can cope with the environment.

Good individuals has more chance to pass on their characteristics.

All individuals tend to be better when time passes.

Steps:

1. Code possible solutions into Chromosome, which is a list of **genes** that contains all information of a solution;
2. Implement a **fitness function** which rates chromosomes (selector)
3. Put all candidate solutions into the simulation of evolution.
4. The good solution wins.

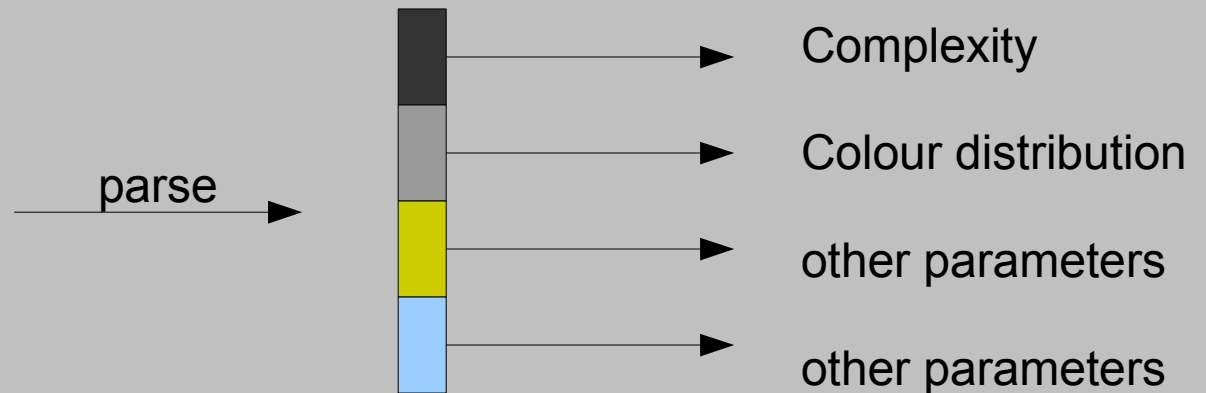
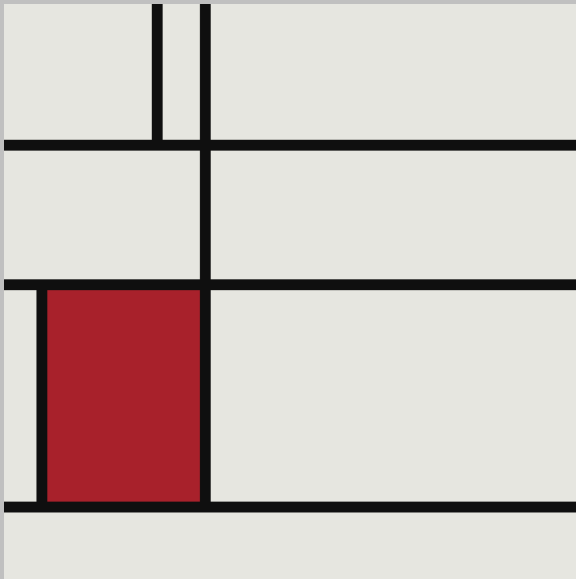
Problems to solve:

Solutions – Pictures generated by computer

Natural selection – a scaffold of genetic algorithm

Chromosome coding – How to present a picture by a collection of genes?

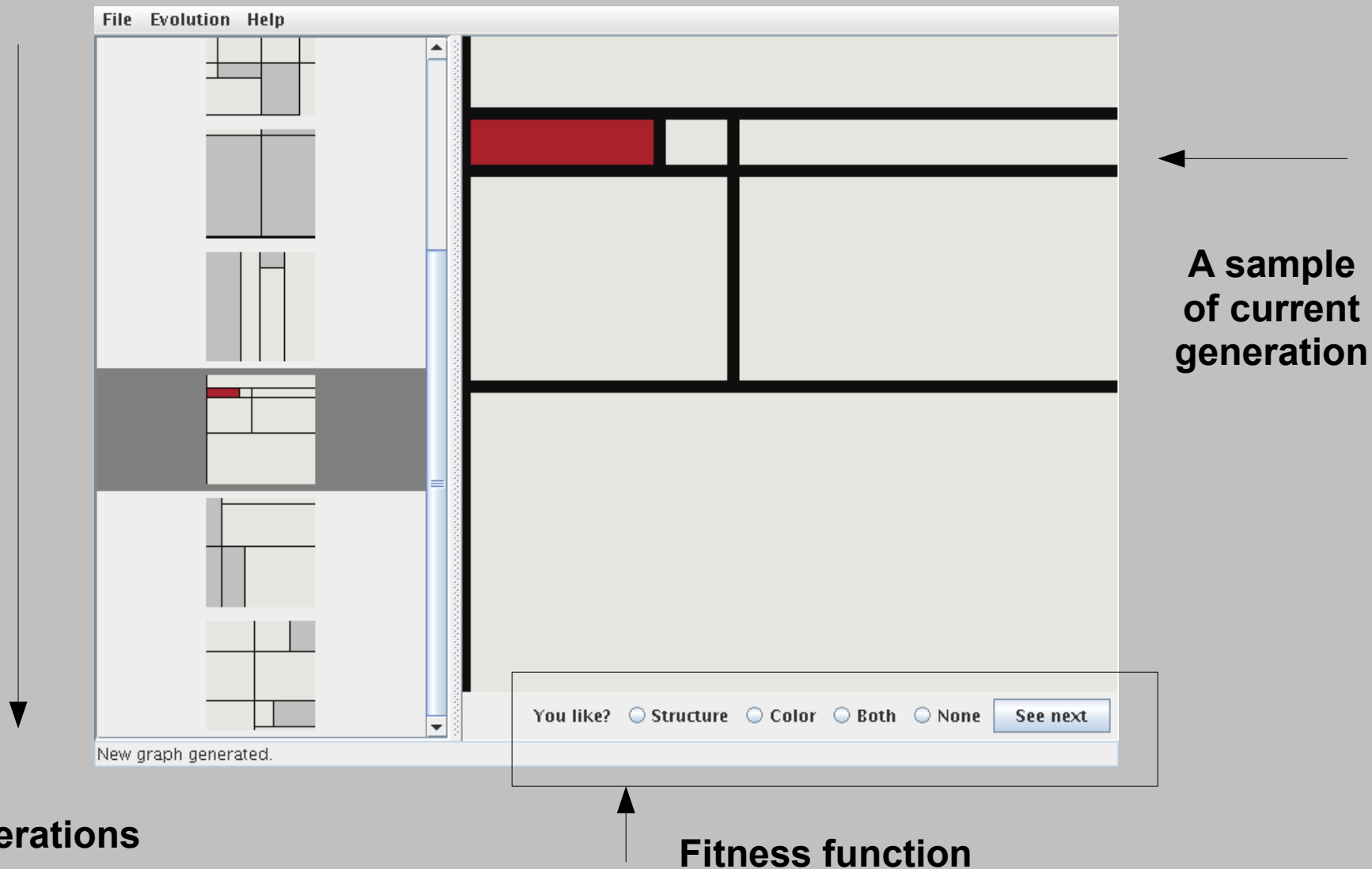
Multiplication - Two solutions produce a new solution

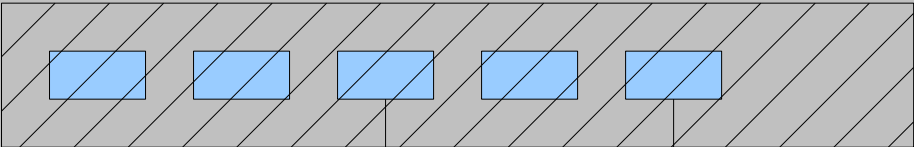


Next page:

Bacterial behavior of multiplication

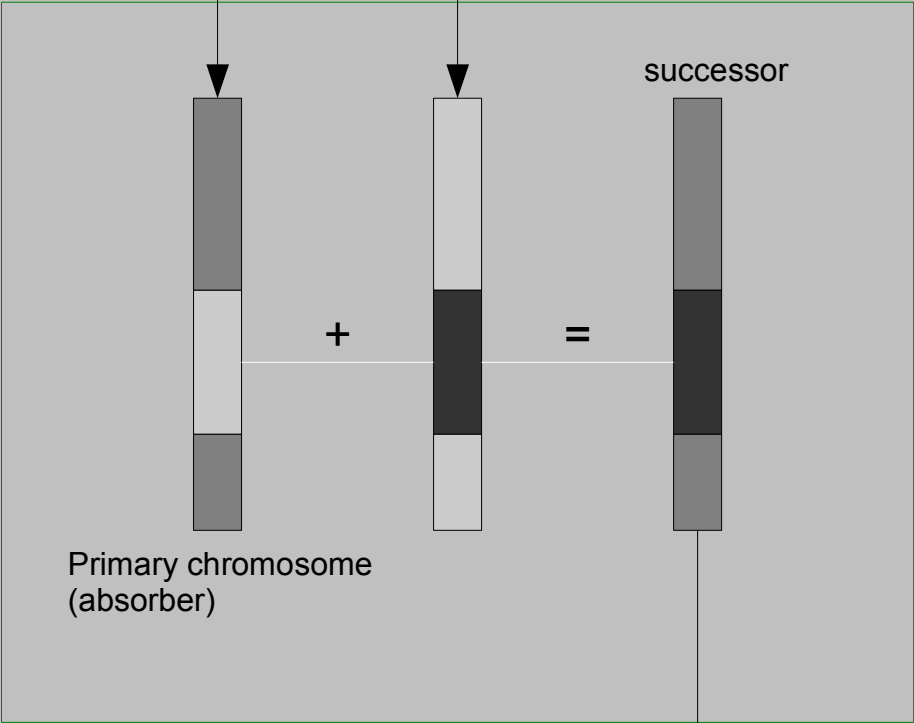
Darwindrian: an AI program that generates Mondrian-like paintings in a bacterial way



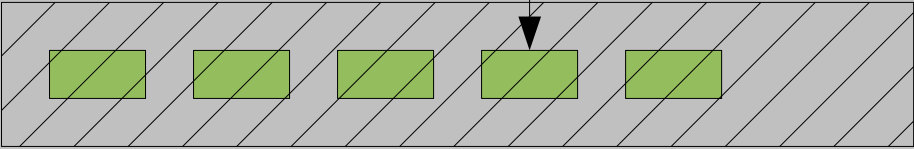


current generation

Selection



Multiplication
Rectangles represent genes.
Better gene has a deeper color.



next generation

Mission next semester:

- Strict definition of chromosome for Mondrian-like painting.**
- Further GUI development.**
- Experiment design and execution.**

Random Generation of Mondrian-like paintings

