AI Assignment 2
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Algorithm's Parameters

A genetic algorithm is used to morph 150 random triangles into something resembling any 512x512 picture.

Population

is a collection of 200 paintings, **selection technique** is to select the best individual from a population and pair it with a random individual from a population.
Where each **individual** is a single painting

Chromosome

is a list of 150 triangles with a certain shape, position and color (red, green, blue and opacity)

Fitness

is the distance (based on pixels) from the target painting (we need to minimise this score)

CrossOver

individuals can **CrossOver**, create a new painting with half of the triangles from one **parent** and half from the other
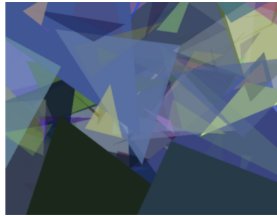
Mutation

individuals can **mutate**, triangles can move, change shape, change color, swap position in the chromosome or reset.
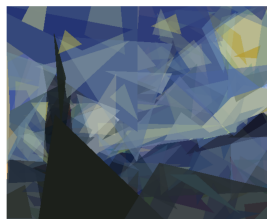
the population can go through a **bottleneck**, where a large portion of individuals (with the worst fitness) is discarded and then the survivors are used to grow the population back to the desired size

Examples

First example is the starry-night :
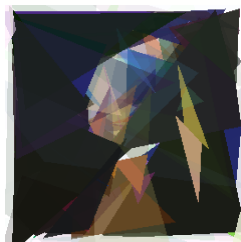
 After 750 iterations

 After 4500 iterations

 Real image

Second example is the girl with pearl earring :

 After 750 iterations
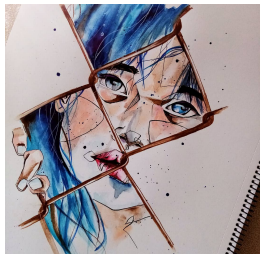
 After 5000 iterations

Real image

Third example is :

After 750 iterations

After 3697 iterations

Real image

Meaning of Art with Elaboration

One picture takes a lot of time(up to 5 hours for just 750 iterations). And if increased iterations up to 5k pictures will be around 3 days

The art for me is using different beautiful colors in a harmonic way so that it doesn't hurt eyes see it, but it is still made up from different colors in different percentages and distribution.

Images produced by the algorithm could be called an art because it's made of geometrical shapes(triangles mainly). Which represents the actual picture in a different harmonic way using different sizes of triangles instead of circles , lines, etc.

Used Classes Description

triangle.py

A chromosome here is a list of triangles. A single triangle has three point with x,y coordinates and a colour with opacity. A few different changes can occur during a mutation, the triangle can move (shift all points), change shape (move points individually) or the colour can change. There also is a more significant event that will destroy the current triangle and replace it with a totally random one. This is all taken care of by the .mutate function. The sigma value can be used to specify the strength of a mutation (how strong the change will be) and the weights are used to specify which types of mutation will occur more often than others.

painting.py

The painting contains a list of Triangles, along with the necessary functions to draw the triangles (using the Pillow library) and to compare the image with the target (using the Imagecompare library). Furthermore, there is a function to mate two paintings, this is inspired by crossing over events in biology where two chromosomes exchange parts to create two new chromosomes.

Conclusion

As the start of the evolution is random, as well as all mutations and breeding events, the output can differ between runs. Also the result of two independent runs each running for 5000 generations, although these images have comparable distances to the target image, they are quite different from each other.